The Adult Education and Training Survey

The Impact of Unionisation on the Incidence and Financing of Training in Canada

R-01-9-1E

by
David A. Green and Thomas Lemieux
Revised, October 2001

SP-471-01-02E

Applied Research Branch
Strategic Policy
Human Resources Development Canada

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Printed/Imprimé 2002
ISBN: 0-662-31599-5
Cat. No./N° de cat.: MP32-29/01-9-1E

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103-03049/

Abstract

This paper uses the 1993 and 1997 Adult Education and Training Survey to look at the effect of unions on the incidence and sources of payment for training in Canada. Simple tabulations indicate that union workers are more likely to engage in training activities than non-union workers. The higher incidence of training among union workers is driven by the fact that they are more likely to take training offered by their employers than non-union workers. This suggests that union workers are more likely to participate in training activities that enhance their firm-specific human capital. This union effect disappears once a variety of factors such as age, education and, in particular, firm size and seniority are controlled for. Everything else being equal, unions have little effect on the provision of training in Canada. Finally, the authors present some limited evidence that unions help increase the participation of firms in the financing of training activities.

Acknowledgements

We would like to thank André Léonard and Zhengxi Lin for their comments on an earlier draft of the paper.

Table of Contents

Foreword ix

1. Introduction 1

2. Previous Literature and Theoretical Considerations 3

2.1 General and Specific Human Capital 3

2.2 Impact of Unions on Training 7

3. DATA 16

3.1 1993 and 1997 Adult Education and Training Survey 16

3.2 AETS Suggestions 20

4. Simple Tabulations 22

5. Probit Analysis of Training Incidence 28

6. Probit Estimates of Source of Payment 42

7. Trends in Union Effects: 1993 to 1997 49

8. Selection 51

9. Conclusions 53

Appendix 55

Bibliography 57

Foreword

The Adult Education and Training Survey (AETS) is Canada's most comprehensive source of data on individual participation in formal adult education and training. In addition to measuring the incidence and intensity of formal adult education and training in Canada, the AETS provides socio-economic and demographic profiles of both participants and non-participants. The survey also provides information on the types, duration and location of training that individuals receive and identifies barriers faced by individuals who wish to take some form of training but cannot. It provides information on sources and types of support for training as well.

The survey sample covers all ten provinces and the sample size is large enough to produce estimates for various sub-populations of interest to policy-makers. The three cycles of the AETS conducted in the 1990s allow policy-makers to monitor changes in the incidence and intensity of adult education and training activities during a period characterised by significant economic changes in Canada.

This research paper is part of a series set up by the Applied Research Branch to expand the research done with the AETS and to provide recommendations for possible improvements to the survey.

1. Introduction

Human capital generation plays a central role in the economic paradigm currently being proposed for Canada by many sources. According to that paradigm, the best path for Canada in terms of future economic growth is to shift more and more toward being an economy centred upon advanced skills. If one accepts that paradigm, the key question becomes how to move the economy in that direction. Moreover, since the skills that will be needed tomorrow are not necessarily the same ones that are most in demand today, we would like to find a mechanism for change that is itself flexible. Mechanisms that are reliant on either educational institutions or governments to lead the way are unlikely to meet the desired flexibility standard. Thus, the best way to proceed is likely to encourage and support mechanisms operating in the market place itself. In many instances, this is interpreted as providing incentives, support and information to firms. However, the investments being proposed are in workers and, so, getting them involved seems crucial. Further, incentives to investment in training that focus solely on the firm may well have problems in terms of equity. Firms are likely to support and implement mechanisms that demand that workers assume the majority of the risk. For these reasons, finding ways to get workers involved in ongoing investment in training is crucial. A natural institution to which to turn when considering issues relating to workers, and particularly to issues related to equity towards workers, is unions. Unions might potentially act both as a conduit for future training policy and as a source of information on how workers would like this process to develop. A first step in understanding what role unions might play in the future is to understand what role they play currently in training in the Canadian economy. Unfortunately, there is little direct evidence on this for Canada. In this paper, we use the Adult Education and Training Survey (AETS) to answer basic questions about the relationship of unionisation to training levels and the sources of payment for training.

Any attempt to study training impacts must start with the standard distinction between general and firm specific human capital. In common parlance in economics, specific human capital refers to acquired skills useful only within the current firm while general human capital refers to skills useful both inside and outside the current firm. There are good reasons to believe that unions will have different impacts on both the levels and funding for the two different types of human capital. For example, unions have been shown to be associated with more stable (i.e., longer tenure) jobs. This could lead to more firm specific

training investment because firms and workers both believe the relationship will last longer and therefore be willing to invest more into it in the union sector. On the other hand, to the extent that workers invest in general human capital to improve their outside option value should the current job end, greater job stability in the union sector could lead to lower investment in this type of training. In recent years, notions of what constitutes general and specific human capital and who pays for training of each type have been refined considerably. It is still the case, though, that union impacts are often theoretically ambiguous, implying the need for an empirical investigation. In this paper, we will first set out different theories of human capital investment and discuss the role of unions within them. We then turn to the AETS to examine the implications of the various theories. We do this first using simple tabulations and then using econometric techniques to control for the impacts of other worker characteristics the effects of which might otherwise be assigned to unionisation. We find that results differ slightly for males and females. For both males and females, unions appear to have only small effects on the amount of either firm specific or general human capital training. There is some evidence that unions do alter the extent to which firms take part in the training investments for males, but little evidence of this for females.

The paper proceeds in nine sections including the introduction. In section 2), we discuss the previous literature and rely on theoretical models set out in earlier papers as a basis for forming hypotheses about the impact of unions on training. In section 3), we discuss the AETS and the decisions we have made in selecting a subsample and set of covariates from it. We also discuss some data limitations and suggestions for how the AETS could be improved for future work on training. In section 4), we present simple tabulations related to training incidence and payment sources. In sections 5), 6), and 7), we present results from probit models of training incidence and payment sources, respectively. In section 8) we briefly discuss issues related to union sample selection. Section 9) concludes.

2. Previous Literature and Theoretical Considerations

2.1 General and Specific Human Capital

Any examination of the impact of unions on training must start with the key distinction between general and firm specific human capital. This distinction is particularly important when considering union impacts because there are good theoretical reasons to believe that unionisation will impact differently on the generation of the two types of human capital. Human capital that is productive both at the individual's current firm and at other firms in the industry or in the economy more generally is referred to as general human capital. Human capital that is productive only within the current firm is termed firm specific human capital. In standard expositions, the two types of human capital differ sharply in who pays for the training, who reaps the reward, and in their implications for job stability. Thus, firms will not invest in general human capital because they cannot be assured of obtaining the returns on their investment. In order to obtain that return, the investing firm will need to pay workers a wage below their marginal product after the investment is completed. The difference between the worker's marginal product and the wage is the return on the investment. However, since the human capital increases worker productivity at other firms as well, the trained worker will be bid away by a non-investing firm which will offer the worker a higher wage than he or she can earn at the investing firm. This is a feasible action for the non-investing firm because it does not have an investment to recoup. As a result, standard theory states that general human capital will be invested in by the worker (or perhaps the government) but not by firms. Workers may pay for the investment by accepting lower wages during the training period, when their productivity is reduced because they are taking time out to train. Their return will be generated from a wage higher than what they would have earned had they not trained – a wage equal to their, now higher, marginal product. Thus, investment in general human capital leads to a steeper wage-experience profile than in the absence of such investment. In addition, there is nothing in this investment to tie individuals to a specific firm and so no implication that job tenure will be either longer or shorter for those who invest than those who do not.

In contrast to general human capital, firm specific capital is valuable only at a particular firm. This implies that firms can invest in this type of human capital without fearing that the trained worker will be bid away by another firm. For example, the firm could pay workers according to a flat wage-tenure profile but

invest in them early in their working lives. Then, worker marginal product will be below their wage in the early part of their careers (this is part of the way the firm invests in the training) but above their wage later. Because the skills acquired are not useful anywhere else, there is no danger of an alternative firm offering a slightly higher wage later in life in order to capture the returns to the investment. Of course, if all the investment is done by the firm then workers have no particular stake in the investment: their wage is the same as what they would earn outside the firm. As a result, workers might leave the firm, effectively walking off with the firm's investment, at any time. Thus, it is often argued that firms will optimally share the investment and the returns to investing with their workers in order to give them a stake in the investment (Becker (1964)). However, Hashimoto (1981) argues that as long as the turn-over rate is known then firms will still invest optimally, even if the worker has no stake in the investment. The firm investment decision will just incorporate the probability of separation. Barron et al. (1999), in an investigation of starting wages and productivity profiles, find that in situations where there is investment in training, productivity increases but starting wages are no different relative to situations without training. They conclude that firms carry the full burden of specific human capital investment but also reap the full reward. If this is true, then wage profiles will be much flatter under firm specific human capital investment than general human capital investment. Further, because firms have a stake in maintaining the employment relationship so they can gain the returns on their investment, one would expect greater job stability under specific than general human capital.

The standard theory of general and specific human capital we have just set out has proven to be a robust and useful framework for thinking about training investments. In more recent years, however, the theory has been refined to fit better both with logical, theoretical implications and with empirical observations. For example, several authors have pointed out that contracts with sharing of investment in and returns to specific human capital are not logically consistent. With specific human capital, it is difficult for an outside party to evaluate the extent and value of the firm specific training. This means that a wage contract stipulating a specific wage increase conditional upon a specified training investment by the worker cannot be enforced. The firm has an incentive to present such a contract but to reneg on the higher wage payment once the training is completed. For this reason, workers will not invest in specific human capital. Papers such as Scoones and Bernhardt (1998) investigate models with self-enforcing contracts in which workers take part in the firm specific investment. In their model, the functioning of the

labour market, and in particular the way outside offers arrive, effectively turns firm specific human capital into general human capital, blurring the distinction between the two. In any case, however the investment is generated, the implication that there will be more investment in firms where the expected tenure is longer continues to hold.

Another major challenge to the standard theory involves the claim that only workers invest in general human capital. Several papers have found that training that appears to be general in nature is not infrequently paid for by the employer (Loewenstein and Spletzer (1998)). This has led to the development of several models in which firms rationally invest in general as well as specific human capital. Loewenstein and Spletzer (1998) develop a model in which a wage contract is specified with a minimum wage guarantee for future periods. Notice that such a guarantee is observable by a third party and so the contract can be enforced. In their model, if the worker's wage option outside the firm is less than the wage guarantee then a small increase in productivity from a general human capital investment does not need to be matched with a wage increase to keep the worker attached to the firm. The worker is being paid more than their outside option both with and without the training, so there is no change in their incentive to move. This means the firm captures the full return to the investment. Thus, even if the investment also increases a worker's productivity in all firms, the current firm has an incentive to invest. A strongly related idea is presented in Acemoglu and Pischke (1999), in which they argue that if there is wage compression, in the sense that the wage that must be paid to keep a worker at a firm rises less rapidly with training than does productivity, then there is again an incentive for firms to invest in general human capital. They discuss several possible sources for such wage compression, including union effects.

To solidify these concepts relating to human capital investment and to provide a framework within which to discuss union effects, we will present a simplified, heuristic version of the model in Loewenstein and Spletzer (1998). In particular, consider a worker with a two period working life. The worker originally is attached to one firm and the firm's initial problem is to establish a wage contract covering the two periods of the worker's life. The contract is negotiated before the first period based on shared knowledge of the distribution of productivity shocks and investment costs for training. In each period the worker can shift costlessly to an outside firm which offers a wage drawn randomly from a known

distribution. We will denote that wage, $w_{Ot}(t=1,2)$ As Loewenstein and Spletzer argue, workers and firms may plausibly agree to a contract with a minimum wage guarantee for each period, which we will call $w_{Gt}(t=1,2)$ Such a guarantee will ensure that firms cannot abscond with too much of the rent generated from any training investment and thus will reduce the likelihood the worker will quit. The wage guarantee must be set to balance benefits to the firm in terms of reducing quit rates with the costs in terms of foregone rents. Workers and firms decide on whether to invest in human capital (either general or specific) in the first period and realize the productivity increase from the investment in the second period. Workers invest in human capital by taking a reduced wage in the first period.

Now consider four scenarios and two types of human capital: general human capital that increases productivity equally in the original and the alternative firm and specific human capital, which increases productivity only in the original firm. In the first scenario, $w_{Ot} > w_{Gt}$ for both periods 1 and 2 (i.e., the wage guarantee is not binding). Loewenstein and Spletzer show that in this situation, workers and firms will share in the investment costs and the returns to specific human capital investment. However, because workers can receive the full value of the productivity increase from general human capital investment from the outside firm in period 2, there is no incentive for the original firm to invest in general human capital. As in the standard exposition, both the investment costs and the returns to general human capital investment fall entirely on the workers. In the second scenario, $w_{O1} > w_{G1}$ but $w_{O2} < w_{G2}$, i.e., the wage guarantee is binding in the second period but not in the first (note that by binding we mean that the original firm would pay less than the guarantee in the absence of the contract because it only needs to meet the outside offer). In this case, as discussed earlier, the firm will reap all of the benefits of the increase in productivity since there is no reason for it to increase the wage paid to the worker, who is already earning more than his outside wage in period 2 (we are assuming that the productivity increase is not large enough to increase the worker's productivity at the outside firm above w_{G2}). This means that there is also no incentive for the worker to invest in general or firm specific human capital in this world. In Loewenstein and Spletzer's more general model, with the wage being potentially at the guarantee in period 2 but above the guarantee in subsequent periods, workers actually share the investments in their version of this second scenario as well.

In the remaining two scenarios, the wage guarantee is binding in the first period. This means that workers cannot take part in the investment since they have no way to lower their wage in the investment period. In the first of these scenarios, $w_{O1} < w_{G1}$ but $w_{O2} > w_{G2}$, implying that the guarantee binds in the first period but not in the second. As in the original scenario, firms have a reduced incentive to invest in general human capital because the outside firm can and will poach their trained workers in the second period: the original firm cannot achieve a return on their general human capital investment. Loewenstein and Spletzer actually show that the firm still has some incentive to invest because of effects in reducing quite rates in the first period but they still argue that there will be underinvestment in this scenario. Thus, we will see investment in specific human capital but little investment in general human capital by the firm and no investment in either by the worker. In the final scenario, the wage guarantee is binding in both periods. Again, workers have no means to invest in human capital because they cannot offer to lower their first period wage. As in the second scenario, firms realize all of the returns to any investment and are willing to invest in both firm specific and general human capital.

2.2 Impact of Unions on Training

With this framework in hand, we now turn to considering the impact of unions on training. To do this, we first need to discuss relationships between union status and various characteristics of the employment relationship. At first pass, we will conduct the discussion as if all union related effects are causal, that is, we have in mind a thought experiment in which a worker is randomly placed in a previously non-union firm and then has direct effects on wage setting, job tenure, etc. Of course, there is a serious selection issue related to which firms get unionized and who chooses to join a union that may mean none of the observed data regularities are in fact causal. We will return to this point below, but initiate the discussion in a simpler framework.

Multiple empirical investigations of union impacts show that employment and pay related outcomes are quite different in union versus non-union firms. The best recorded difference is in average pay levels, with workers in union firms earning an average of approximately 15% more than comparable non-union workers. Unions also are well documented to be associated with reduced wage differentials by education level, job tenure and gender. Thus, the wage-tenure profiles at union firms are higher but flatter than at non-union firms. In addition, unionized workers tend to have longer job tenure than non-

unionized workers. One main line of thought on what unions do is that they provide workers with a way to correct perceived difficulties in the workplace. Without unions, individual workers may find they have little ability to induce change at work and thus choose to leave the firm when they face difficulties. In contrast, unionized workers can use the union as a mechanism for change. This is the well-known "exit" versus "voice" trade-off. Authors such as Freeman and Medoff (1984) argue that this is behind longer job tenures at unionized firms and may also make for a more content, productive workforce. An alternative view of what unions do is that they grab rents from firms, in part by instituting rigid work rules that make it difficult for firms to substitute away from unionized workers in an attempt to protect their rents.

Given these regularities and views on what unions do, how would we expect them to affect the level and composition of training at individual firms and in the economy as a whole? In the model presented above, we could assume that unions have two main effects: 1) they establish higher wage guarantee levels or, in the extreme, make the guarantee credible and therefore feasible; and 2) they increase worker attachment to the firm.

The first effect implies that unions make it more likely that an employment relationship fits in one of the latter three scenarios. To the extent that unions set high first period wages (i.e., flatten the wage-tenure profile by raising entry wages), they preclude credit constrained workers from being able to finance investments in either general or firm specific human capital. In scenario 3, where firms do not have an incentive to invest in general human capital, this means that unions will reduce training by reducing worker ability to invest. Mincer (1983), among others, argues this is a plausible union effect. However, to the extent that unions also set wages high enough to have binding wage guarantees in the second period, there will not be a reduction in investment with the introduction of unions. Instead, having a union wage structure will just imply that general human capital investment, and specific human capital investment, will be entirely funded by the employer. Thus, the empirical implications of unionisation when unions raise the entry wage are that union workers will have either lower (under scenario 3) or similar (under scenario 4) levels of general human capital investment compared to non-union workers; that union and non-union workers will have similar levels of specific human capital investment under either scenario; and that more of the funding for both general and specific human capital investment of union

workers should be supplied by employers. A simpler version of the human capital model would imply that workers do all the investing in general human capital with or without unions and thus unions can only have negative effects by precluding investments through lower first period wages.

The second effect, that unions strengthen the attachment of workers to firms by enabling them to voice their concerns about the workplace, implies that unionized firms should be more willing to invest in the human capital of their workers. This implication holds both for specific human capital and, in the scenarios where firms invest in general human capital, general human capital as well. Quite simply, in any scenario in which firms are willing to invest in human capital, they will be more likely to make such an investment the greater the probability that the trainees will remain with the firm for long enough for the firm to earn a return. Thus, the greater stability engendered by unions should imply more investment.

Kennedy et al. (1994) argue that unions may have a negative impact on training through an alternative route. Specifically, strict union rules about job content and assignment may imply that firms have less incentive to train workers for anything other than a very narrowly defined task. Whether this would imply lower training levels is not clear, though it would almost certainly imply a reduction in efficiency.

A further extension to the standard general/specific human capital framework is suggested by Kuhn and Sweetman (1999) who argue that it may be fruitful to split general human capital into general human capital that is useful both inside the current firm and in other firms, and general human capital that is useful only at other firms. The latter category is one that is not typically considered but makes some sense. Individuals may initially invest in skills of various types before they know what firm or industry they will be associated with. Once they join a particular firm, they will likely invest further in some of those skills but let others, which are not directly relevant for their current firm, atrophy. Kuhn and Sweetman argue that workers in firms with more turnover will be more likely to invest in the general human capital that is not directly relevant at the current firm in order to keep their options open. Since unions are associated with more stable employment relationships, union workers will be more likely to under-invest in general human capital that is not relevant at the firm. Kuhn and Sweetman investigate this theory using data on displaced workers. They find that post-displacement wages actually decline with the length of job tenure on the pre-displacement job for union workers but that post-displacement wages rise with pre-displacement tenure for non-union workers. One possible explanation for this

pattern is that union workers stop investing in general human capital relevant in outside firms while non-union workers continue to make such investments.

The Kuhn and Sweetman hypothesis matches the models that attempt to explain firm investment in general human capital in an interesting way. One might be able to rationalize the wage patterns that Kuhn and Sweetman observe using the standard two category system consisting of general and specific human capital, assuming that not investing in human capital means that the worker's human capital stock depreciates. In a situation where the worker invests in general human capital, the job security associated with unions could mean under-investment on the part of workers and resulting large wage losses when displacement occurs. Similar results would follow under scenario 3 where workers and firms under-invest in general human capital because of the combination of a high wage guarantee in the first period and no guarantee in the second. However, if unions actually establish wage floors at all tenure levels, as seems most plausible, then firms would invest in general human capital and one would not expect to see the empirical patterns presented by Kuhn and Sweetman. One could observe firms investing in general human capital and the wage patterns uncovered by Kuhn and Sweetman if there were human capital of a type that was not useful in the current firm. In that case, firms would invest in specific human capital and general human capital relevant in their own firm as well as others but not in general human capital useful only outside the current firm. Such a pattern might fit with the existence of industry specific human capital, which would fit in the category of general human capital useful at the current firm and in other firms. Industry specific human capital that is useful in an industry other than that of the current firm might then compose Kuhn and Sweetman's "alternative" human capital category. Neal (1995) and Parent (2000)'s work suggests that it is fruitful to consider industry specific human capital. In the empirical analysis that follows, we will make use of the concept of alternative human capital, which we will define as human capital that is not valued by the current firm and therefore not invested in by that firm.

Kuhn and Sweetman's hypothesis is written in a way that generates testable implications with displacement data. Does it have testable implications in our kind of cross-sectional survey of training? Consider a matching model in which the value of the match is revealed only gradually during a job. Thus, when a job match is formed, the worker-firm pair draw a value for match quality (productivity) from a distribution with a known mean. However, the match quality value is not directly observed because of

temporary, random shocks to productivity. The worker and firm use the observed output values for successive periods to update their best guess on the match value. If the expected match value falls below some threshold, the worker and firm terminate the relationship. In this situation, workers will keep investing in general human capital that is valuable to firms outside the current relationship until they ascertain that the match quality is of high enough value to guarantee that the relationship will not terminate (and longer, if there is an exogenous termination rate that is sufficiently high). Introducing unions might be modelled in two ways. First, unions increase the amenities at a firm, lowering the workers' threshold value of wage payments for leaving the firm. Second, the union may enforce tougher separation rules and remuneration. In both ways, unions would then be associated with longer job tenure. In a matching model such as this, the time until a match is proved to be of sufficient quality not to terminate it will be shorter in a union environment where such a threshold quality will be lower. That means that union workers will stop investing in general human capital sooner than non-union workers. Thus, in our data, Kuhn and Sweetman's hypothesis should be reflected in the tenure profile of general human capital investment. In particular, investment in general human capital should decline with job tenure in both sectors, but it should decline faster in the union than the non-union sector.

The theories discussed to this point have been discussed as if unions have direct, intentional effects on wage profiles and work conditions which then have unintended side-effects on training outcomes. However, it seems inappropriate to treat unions as acting this myopically. Acemoglu and Pischke (1999) consider union impacts on training in a model that is in the spirit of a union monopoly model of wages and employment. In union monopoly models, unions set wages while firms determine employment based on the contract wage, but unions recognize how firms will respond in determining their preferred wage. In their model, Acemoglu and Pischke consider a union choosing its preferred wage profile in part considering the effect of that profile on firm investment. As mentioned earlier, their model focuses on firm investment in general human capital with the incentive to make such an investment stemming from a flattened profile of the wage the firm must pay versus training. Acemoglu and Pischke essentially assume that unions induce a scenario like the fourth scenario above, with the union wage being above the outside option in all periods. In that situation, unions have an incentive to institute a flat wage profile because such a profile induces firms to invest in general human capital. Thus, their model provides a rationale for unionized firms having flattened wage profiles. Given that unions raise average

wages above those available at non-union firms, their model also implies that unionized firms will invest more in general human capital than will non-union firms.

Acemoglu and Pischke are not the first to consider the issue of how unions would optimally decide on an approach to training. Weiss (1985) considers the problem in the context of a union model in which senior union members control union decision making. In Weiss's model, senior union members are able to extract a transfer from junior members. However, the size of the transfer must be below some maximum size. In that situation, the senior members can only increase the total transfers paid to them by increasing the number of junior members (i.e., new hires). However, hiring new members has an adverse effect on senior wages through a standard supply effect. To offset this, the senior members establish a contract that requires the junior members to train, which effectively limits the amount of labour they actually supply. Thus, unions governed in this way generate excessive training in the presence of a limit on transfers. Barron et al. (1987) present a counter argument, stating that placing an upper bound on transfers is artificial. Instead, they analyse the same model incorporating a lower bound on the net wage for new hires (i.e., their wage taking into account lost time due to training and the transfer to senior union members), which they argue might arise from minimum wage laws or minimums set in bargaining between older and younger workers. Under this scenario, with senior members again controlling the union, senior members can maximize the total transfer by under-training junior members so that there is a greater excess of the wage paid over the minimum to be grabbed as a transfer. Thus, whether unions over-train or under-train depends crucially on the nature of the restrictions faced by senior members in maximizing the transfers from junior members. It is not clear on the face of it which restriction is more natural. Both Weiss (1985) and Barron et al. (1987) argue that the transfers need not be taken straight out of wages received but might be obtained through less direct methods such as forcing junior members to take less pleasant shifts. With such indirect transfers a minimum wage would not be binding on the wage net of transfers. On the other hand, as Barron et al. (1987) point out, it is not easy to point to an existing institutional form that looks like an upper bound on transfers. It might be the case that the form of any restriction on transfers is a feature of specific labour markets and the bargaining environment between junior and senior union members. The outcome then becomes an empirical matter. It is worth noting that in Acemoglu and Pischke (1999)'s analysis the workers are

treated as homogeneous and these problems of the political economy of union decision making do not arise.

The empirical papers on the impact of unions on training provide quite mixed results. Much of the evidence is from the US and dates from the time when unions were considered important enough to warrant study there. Some of the first studies to examine union training impacts were Duncan and Stafford (1980) and Mincer (1983). Using the 1969-71 National Longitudinal Survey (NLS) for the US, Mincer found that older (48 to 64 year old) union workers who do not change union status between years (union stayers) had significantly less training than older non-union workers who did not change status(non-union stayers). Older workers who moved from a non-union to a union job (union joiners) also had less training on the union job than older workers who stayed in their non-union jobs. For younger workers (17 to 27 year old) union stayers and joiners had less training than non-union stayers but the effects are nowhere near statistical significance. This pattern might fit with Kuhn and Sweetman (1999)'s argument that union members invest less in general human capital as their job proceeds because of perceived job stability. However, any conclusions from the NLS in these years must be drawn with extreme caution since the training question is, "Do you receive or use additional training (other than school training) on your job?" This question confuses investment in with use of human capital. Since these need not coincide in all firms (think of the example of firms that poach trained workers from other firms), it is not clear how to interpret the results derived from this question.

Barron et al. (1987) also find a negative effect of unions on training. In their case, the data is from a survey of employers who are asked about how much and how they provide training to new workers. The questions appear to be geared toward firm specific human capital investment, asking about training provided by specially trained personnel, coworkers and by the employee watching others work. Barron et al. (1987) find that the proportion of the firm's non-supervisory workers covered by collective bargaining is statistically significantly negatively related to measures of management provided training, worker provided training, and total training. It is difficult to know from the reported results what sectors the firms operate in. Thus, for example, if there are a substantial number of construction firms then unionized firms may provide less training to the extent that tradesmen get their training through their trade union.

On the opposite side, Lynch (1992) uses data from the National Longitudinal Survey of Youth (NLSY) for the US for 1980 and 1983 to show a positive effect of unions on training. The NLSY is closer to the sample we use, asking "In addition to your schooling, military and government-sponsored training programs, did you receive any other types of training for more than one month?" It also asks where the individual received the training. Lynch finds that union membership has an insignificant impact on training received outside the firm, but positive and strongly significant impacts on training received on the job site and apprenticeship training. Similarly, using a survey of Australian firms, Kennedy et al. (1994) find that firms where unions are actively involved in bargaining have significantly more training. The authors argue that the distinction between mere union coverage and active unions is crucial in the Australian context, showing that a union density variable does not have statistically significant effects but a measure of union activity does.

Green (1993) uses British data to investigate the inter-relationships among training, firm size and unionisation. Green's main finding is that unions have significant positive effects on training in small firms but virtually zero effects in large firms. This is an important result because it is often difficult to separate union effects from the effects of more formal complaint and wage processes instituted in larger firms. Large firms also are observed to pay a wage premium relative to smaller firms. Thus, a situation like scenario 4 might plausibly exist in non-union, large firms as well as union firms. Green's results indicate that some care must be taken in controlling for firm size in our investigation.

Our investigation of human capital investment and union effects points to several hypotheses we can investigate using our data. First, unionized workers unambiguously should have more investment in firm specific human capital because of union effects on worker stability. Earlier empirical results suggest that most of this investment is borne by the firm. Second, predictions about levels of general human capital investment and who pays for them depend on assumptions about the union wage structure. Under the reasonable assumption that unions institute wage floors beneath the wages of all workers, with higher floors under new entrant wages (scenario 4), unionisation does not change the amount of general human capital investment but does mean that paying for the investment, which is carried out by the workers in non-union firms, will be done by the firm. If unions place a high wage floor under entry wages but not those for higher tenured workers (scenario 3) then there will be very little investment in general human

capital in the union sector: workers cannot offer to take lower initial wages to fund the investment and firms have no way to ensure they receive the return on any investment. If unions place a wage floor under more senior workers but not under junior workers (scenario 2) then, again, union workers will have the same general human capital investment as non-union workers but it will be paid for by the firm. However, as Loewenstein and Spletzer point out, this latter conclusion could be tempered to the statement that workers and firms will share in the investment if the wage guarantee is expected to bind in some periods but not others. Finally, if there are no binding wage guarantees in the union sector (scenario 1) then the union sector should look the same as the non-union sector with similar levels of general human capital investment paid for by the worker. Third, under the additional assumption that there is general human capital which is valuable outside the current firm and which depreciates if it is not invested in further, investment in general human capital by workers will exist in union firms but it will occur at a lower level and will decline faster with tenure in union firms than non-union firms. The net effect of unions on general human capital investment is uncertain. The greater stability of union employment will lead to more investment in situations where the firm is paying but less investment where the worker is paying. Fourth, Green (1993)'s results imply that any investigation of union effects must include careful controls for firm size effects.

3. DATA

3.1 1993 and 1997 Adult Education and Training Survey

Our main investigation is based on the Adult Education and Training Survey (AETS) for 1997. We also present some evidence from the 1993 AETS to show the trends in training during the 1990s. The AETS is a supplementary survey attached to the Labour Force Survey (LFS) which contains both the LFS questions on basic personal characteristics such as age, gender, education level and job tenure and an extended battery of questions on training in the previous calendar year. The AETS is not a perfectly random sample of the Canadian population, and we use the weights provided with the survey in all our calculations. We make several sample cuts to obtain a sample tailored to the issues we are investigating. We are primarily interested in investments in training and education that are related to work after individuals have finished their main formal schooling. For that reason, we omit individuals who are full time students or over age 65 at the time of the survey and individuals who did not work during the sample year.[1] Because we are interested in how union status affects investments in and by employees, we also cut out individuals who are self-employed on their main job at the time of the survey.[2] The original AETS sample contains 33,410 and 41,645 individuals in 1993 and 1997, respectively. Our sample cuts result in a sample size of 18,033 observations in 1997 and 21,344 observations in 1993.

The AETS contains information on up to five education or training spells in each of three categories: programmes, courses, and hobbies. The ordering of the training questions in the questionnaire is important to keep in mind in attempting to understand the content of these three categories. Individuals are first asked, "At any time during 1997, did you receive any training or education including courses, private lessons, correspondence courses (written or electronic), workshops, apprenticeship training, arts, crafts, recreation courses, or any other training or education?" Conditional on an answering yes to

1 We excluded all those taking schooling full time since we wanted to focus on job related and funded training. Since we are studying union impacts it seemed necessary to focus on training while employed otherwise we would end up lumping all those who were not employed (or at school full time) into the non-union category. Note also that though we are only looking at individuals who were employed at some time during the previous year, we do not restrict our analysis of training to training episodes undertaken while the individual was working. For example, we may have cases where an individual took a course early in the year and then took a job later in the year.

this first question, respondents are then asked if the training was intended to obtain a high school diploma, a formal apprenticeship certificate, a trade or vocational diploma or certificate, a college diploma or certificate, or a university degree, diploma or certificate. An answer of yes to any of these questions initiates a series of additional questions related to what are called "programmes." Programmes thus consist of training or education spells aimed at obtaining a formal certificate. Whether or not the respondents answer yes to taking programme training, they are then asked whether they took any other courses. Finally, respondents are asked if they took any hobby type courses.

Our focus in this paper is on work related training. For that reason, we do not count hobby spells as training.[3] For both programmes and courses, respondents are asked the main reason for taking the training, with possible answers being: 1) a current or future job; 2) personal interest; 3) other. We select only programme and course spells for which the respondent answered that the main reason for taking the training was the current or future job. Thus, for individuals who have only hobby spells and/or only programmes or courses done for personal interest, we keep the observation but treat it as if there was no training spell. Even after doing this, there are a considerable number of observations for whom we observe both work related programme and course training spells and/or multiple programme or course training spells. We view programme and course spells as potentially quite different, with the first being more like going back for more formal schooling and invariably being associated with obtaining a formal ratifying document of some kind, while the latter may contain a variety of types of work related courses. Indeed, we will argue that programmes can be viewed as relating purely to general human capital formation while at least some courses may be related to firm specific human capital formation. Given this perspective, we elected to keep information on programme and course training separately for each respondent. In order to simplify the exposition, we focus on only one course and/or programme per person. For an individual with multiple course spells, we select only the spell with the longest duration

2 It would be preferable to use self-employment status during the previous year but this question was not asked in the 1993 AETS. We have performed the estimation for 1997 using the two alternative definitions and found very similar results.

3 Though some hobbies or personal interest courses may actually provide skills that would also be useful on the job, the large majority of these training activities are not job related. We exclude hobbies to make sure the training activities we analyse are perceived by employers, employees and unions as job-related skill-enhancing activities.

and similarly select the longest duration programme spell for individuals with multiple programme spells. For individuals with both multiple programme and course spells, we record the longest of each.[4]

The discussion in the previous section pointed out that there are good theoretical reasons for anticipating different impacts of unions on specific versus general human capital. More importantly, the distinction between general and firm specific human capital becomes blurred once we introduce frictions between wages paid in the current firm and those offered at outside firms. Thus, a more useful distinction is one between investments in human capital that are easily verified by alternative employers versus ones that are only directly observable by the worker and his or her current employer. The former can provoke offers from alternative employers attempting to poach the investment while the latter cannot. This is a somewhat different distinction from the traditional technologically driven distinction between skills that are useful only with the current firm's technology versus skills that are useful with in the production functions of other firms. With the distinction based on observability in mind, we examine several different possible schemes for classifying the training spells we are studying into general versus firm specific human capital categories. As stated earlier, we view programme spells as being clearly related to general human capital. In these spells, individuals work toward formal qualifications which by their very nature signal to prospective employers throughout the economy that the individual has acquired a set of skills. Indeed, the point of this type of education is often to prepare individuals for productive work in general not for work at a specific firm. Thus, all the schemes we examined share the feature that all programme spells are always classified as general human capital. This means that the definitional issue comes down to whether and how to classify course spells.

The first, and simplest, classification scheme we use for the course spells is to define all course spells as being related to firm specific human capital. While this is clearly an exaggeration, we will argue that other possible schemes create more problems than they solve. In the end, we believe that the simple

[4] This choice has little consequences for training programmes since only 3 percent of individuals taking a programme took more than one programme during the year. The program of the longest duration represents 99 percent of the total duration for all programs taken. It is more common, however, for the same person to take more than one training course during the same year. 35 percent of people who took training courses took more than one course in the same year. Nonetheless, the longest course accounts for 85 percent of total hours of course training. So even in the case of training courses, we lose little information by focusing on the longest spell of training.

association of programme spells with general human capital and course spells with firm specific human capital is the most robust approach for portraying the direction, if not the exact magnitude, of the relationship between unionisation and the different types of human capital generation. Nonetheless, we will discuss the other approaches we considered in order to provide insight into the usefulness of the data set for illuminating this crucial training distinction. We will also present some of our results using an alternative classification of general and firm specific human capital as a check on robustness.

The alternative we implement in our empirical work focuses on who actually provides the training. The survey asks questions about who provided the training, with possible answers including an educational institution, a private educational or training institution, and the place of work. We assume that training taken at work is specific to the current firm and is not easily observable to alternative firms. Indeed, if the training was intended to generate general skills, it is unlikely that it would be efficient for the course to be provided by the employer since public or private educational institutions would have a comparative advantage in providing such training. Thus, in the third definition, all course training provided by the employer is classified as specific training and all other course training plus programme training is defined as general training. This definition fits with standard classification schemes in other papers where training spells are separated into those done on the job versus those done off the job.

We also considered further alternative classification schemes which we do not actually implement because of data limitations. One alternative we considered is to classify as general human capital related, course spells for which the respondent answered that obtaining formal qualifications or meeting legal requirements were somewhat or very important reasons for taking the course. All other courses were classified as firm specific human capital related. This scheme was based on the same reasoning as is behind our classification of programme spells as general human capital related: formal qualifications (and meeting requirements) are observable to other employers and hence the worker can more easily get credit for their skills outside the current firm. The difficulty with this approach is that over 20 percent of training spells have "not applicable" as the recorded answer to the questions of whether the main reason an individual took the spell was to get formal qualifications or to meet a legal requirement. It is not at all clear what this "not applicable" category means- that is, why a set of individuals who meet the conditions

for the question (i.e., to have taken the spell for work related reasons) would be recorded as "not applicable." For this reason, this refinement turns out not to be viable.

We also considered making use of two other questions on why the individual took the training spell. One question asked how important the individual considered upgrading knowledge or skills for the current job as a reason for taking the spell while the second asked the respondent how important he or she considered upgrading knowledge or skills for a "different or future job." Investment for which the respondent answered that upgrading skills for the current job was somewhat or very important but that upgrading skills for a different or future job was somewhat or very unimportant we define as firm specific human capital related. All other spells are defined as being general human capital related. While this approach is good in that we are potentially using the individual's own opinion on whether the investment related only to his current firm, the questions are actually not stated precisely enough to be very useful. An individual who believes she is not going to leave the current firm in the near future may state that the reason for taking the training was related only to the current firm even if the training itself is general in nature and therefore would be productive in other firms.

3.2 AETS Suggestions

As a result of working with the data and reading empirical papers using other data sets, we have a number of suggestions for potential future improvements to the AETS. The first relates to our attempt to define specific versus general human capital. The questions we attempted to use ask workers about their intentions for using the human capital in which they are investing. We believe that this confuses two issues: where the skills are useful and what the individual intends to do in the future. It would be good to have questions related to where the skills might be applicable. Thus, questions along the lines of, "is this training useful in firms outside your current firm? outside your current industry?" "Is it useful inside your current firm?" would help untangle general and firm-specific capital in the data. The current distinction between courses and programmes is only loosely linked to specific vs. general human capital since some programmes provided by the employer can be quite specific. Similarly, in some industries courses provided by employers can be very general (e.g. computer courses, language courses, etc.).

The second relates to issues about earlier training. Training, as in many other economic outcomes, likely has a diminishing returns feature. That means that individuals who have already invested in human capital may not be likely to do so in the time period covered by the survey. To the extent something like unionisation changes how often individuals switch jobs, and thus how often they need to reinvest, not knowing how much previous investment has taken place could lead to an underestimate of union impacts. Thus, a series of questions on investments both inside and outside the current firm would be useful. Some US training surveys ask questions on this in particular. Third, some American surveys have asked the question, "how long does it take a new worker to train for a job like yours?" This is a very useful question for establishing the technical level of the job and allowing for controls in that dimension. It would be very useful to include such a question.

4. Simple Tabulations

As a first step in characterizing the data, we would like to establish whether unions are associated with different levels of training of any kind. In all the work that follows we use a union dummy variable that equals one if the individual was a member of a union or was covered by a collective agreement on their main job during the previous year.[5] Table 1 provides basic tabulations on whether an individual received training in the previous year (we do not limit the sample to individuals working while taking training). The first row corresponds to whether an individual receives training of any work related type while employed in the previous year, broken down by union status and gender. The first two columns reveal that, overall, union workers are only 4 percentage points more likely to train than non-union workers. However, this small union effect hides noticeable differences within subgroups. While union and non-union males are equally likely to train, the proportion of unionized females who train is 0.08 higher than non-union females.

The second and third rows of Table 1 contain results relating to our first, simplest definition of general and firm specific human capital: general human capital is equated with programme training while specific human capital is equated with courses. Differences between union and non-union workers are much sharper when one looks at these subcategories. Thus, for all workers pooled together, the proportion of union workers who get programme training is 0.02 lower but the proportion who get course training is 0.06 higher. The direction of these differences holds up in the specific gender groups, with females showing the largest difference in specific training. For females, the proportion of union workers who get course training is 0.10 higher than the similar proportion of non-union female workers.

The last two rows of the table present results relating to our alternative definitions of general and specific human capital investment, in which specific training is defined as only course training that is directly provided by the employer.[6] By this definition as well, union workers get more

[5] In the 1998 AETS, union status can be defined either from the AETS question itself or from a question in the LFS. We use the question from the AETS itself because this permits comparability across years.

[6] We do not report results using the other definitions of firm-specific vs. general human capital discussed in Section 3.1 because they left us with only a small fraction of training activities being classified as "firm-specific."

specific human capital training than their non-union counterparts. The general training again favours non-union workers for males but union females are now more likely to train than their non-union counterparts. Thus, for males the patterns fit with a model in which union firms are willing to invest more in specific human capital because of added worker stability, but this is partially offset by reduced investment in general human capital. For females there is no such trade-off using the second definition of specific human capital: union and non-union workers receive very similar levels of general training but union workers get more firm specific training. The same trade-off between general and specific human capital investment witnessed for males is seen for females if we use the first definition of specific and general human capital.

Table 1 **Basic Tabulations of Training Rates**

Type of Training	All Non-union	All Union	Males Non-union	Males Union	Females Non-union	Females Union
Training	0.28	0.32	0.28	0.29	0.28	0.36
Program Training	0.097	0.076	0.097	0.066	0.098	0.089
Course Training	0.20	0.26	0.20	0.23	0.20	0.30
Both Program & Course	0.016	0.018	0.018	0.012	0.014	0.026
General Training	0.22	0.21	0.22	0.19	0.23	0.25
Firm-Specific Training	0.062	0.11	0.062	0.11	0.061	0.12

As discussed in the previous section, considerable attention has been paid to the issue of who actually pays for training. Table 2 contains a breakdown of the source of payment by training type, again separated by union status and gender. The numbers in the table correspond to the proportion of trainees of a particular type who state that some or all of the training was funded by a given source. Note that respondents are able to list multiple funding sources so there is no reason to expect the reported proportions to sum to one. While it is hard to be certain, the wording of the funding questions in the survey point toward individuals interpreting this as direct payment for training as opposed to indirect payments through accepting lower wages on the part of the workers or paying wages above marginal product on the part of the firm. We do not view the earnings data in the AETS as detailed enough to allow us to evaluate indirect forms of payment. We begin with a discussion of the first two columns of

the table where male and female outcomes are pooled together. For programme training, which we argue is one way one might define general human capital investment, the patterns fit broadly with the discussion in the previous section. In particular, the majority of the direct payment for this training is made by some combination of individuals and the government. This fits with the traditional view that general human capital investment should be done by either the worker or by society. However, as in earlier studies, we find evidence of a substantial amount of investment by employers as well. For course training, shown in the second panel of Table 2, close to 0.9 of the funding is carried out in whole or in part by employers. Financing by the worker is much smaller than with programme training and in close to half the cases where there is investment by the worker, that investment is shared with the firm. The government also plays a much smaller role in this type of investment than in programme training. The payment proportions fit with findings in earlier studies indicating that employers pay for most of firm specific investments on their own. For non-union workers, for example, the proportion of course training involving some firm investment is 0.88 and the proportion involving firm investment with no sharing of the investment with the worker is 0.8.

The last two panels of the data regroup training spells according to the alternate definition of specific human capital based on whether the firm provided the training directly. Not surprisingly, the proportion of firm specific training defined in this way which involved employer participation was close to 1.0. Individuals take only a very limited role in funding this firm specific training, with much of that limited involvement shared with firms. For general human capital defined in this way, employers are actually involved in funding a greater proportion of spells than individuals, with governments playing a smaller, though still substantial role.

Discussing the results in Table 2 in terms of their implication for union-non-union training differences is somewhat tricky. The theories discussed earlier are mostly concerned with whether training will occur at all, while the table entries relate to who pays for the training conditional on it happening. Moreover, worker ability to invest in training is often related to their ability to take wage cuts in early periods of their working life. The evidence in Table 2 corresponds to direct payments for training and therefore cannot help in drawing conclusions related to indirect payments through wage cuts. With that in mind, recall that under either of scenarios 2 or 4, the union firm will take on the investment in general human

capital. Workers, on the other hand, cannot gain any return to the investment in terms of wage increases because the wage guarantee will be binding at higher tenure levels. Thus, investment in general human capital should be funded more by the firm and less by the worker in the union versus the non-union sector. Examining the programme based definition of human capital for men and women pooled together, there is limited evidence in support of this conclusion. Employers are more likely to take part in funding general human capital in the union sector but workers themselves are investing to the same degree in both sectors. Indeed, we could follow Kuhn and Sweetman in assuming that general human capital can be divided between capital useful in the firm and capital useful outside the current firm (alternative capital). Then, we could define the worker investment in general training useful within the firm as being reflected only in the investments they share with the firm. By that measure, union workers actually invest more in this type of general human capital than do non-union workers. Staying with these definitions, there are more spells with worker investment but without firm investment in the non-union than the union sector (0.49 versus 0.43). If we assume such funding reflects investment in alternative human capital (or at least general human capital investment from which firms cannot capture the return), this could correspond to union workers investing less in alternative capital because of greater perceived job stability.

The broader definition of general training given in the second to last panel of the table yields somewhat similar results. Employers again take a larger role in investing in general human capital in the union relative to the non-union sector. With this measure investment by the worker is also higher in the non-union than the union sector. Together these observations fit well with a model in which higher job stability in the union sector encourages more investment by firms but less investment by workers. As with the earlier measure, investments by the worker without firm involvement is higher in the non-union than the union sector (0.27 versus 0.21).

Implications of the models for firm specific investment patterns are unclear. One would generally expect firms to play a large role in such investment and earlier empirical work suggests that they handle this investment almost exclusively. According to older models of firm specific human capital investment, firms may require workers to share in the investment in order to ensure that workers maintain an attachment to the firm and do not walk away with the investment. One might hypothesize that firms will

require less investment from workers in situations of greater job stability, such as that engendered by unions. However, Hashimoto (1981) shows that as long as the separation rate is known, there is no necessity in a firm sharing the investment with the worker. Any sharing rule can be optimal. Thus, there is no direct implication for differences in funding sources between the union and non-union sectors for firm specific training. The results for the course training definition of firm specific training are consistent with these ambiguous predictions. They show no sizeable difference between employers and workers involvement in the union and non-union sectors. However, this may just arise because our definition is not narrow enough and we are capturing some general human capital effects. Our other definition is, if anything, too narrowly defined. According to that definition, there is little difference in the (very high) rate of employer participation in investment in specific human capital while workers themselves play a larger role in the investment in the union sector. The theory provides no good explanation either for this result or for the result that, using either measure of specific training, the government plays a larger role in the union than the non-union sector.

Table 2 also allows us to investigate gender differences in training funding. For general training, by either measure, the patterns are generally similar for males and females. The main distinction is that the difference between the union and non-union sectors in the proportion of training in which workers take a direct role is smaller for females than males. Employers also play a smaller role and workers play a larger role in investing in general human capital for women relative to men. This could fit with lower job attachment for women possibly stemming from child care responsibilities, implying that firms are less ready to invest and they must pick up more of the responsibility for investing themselves. For firm specific training, female workers again play a much larger role in investment than do their male counterparts, and this is more the case in the union sector. As before, theory provides little guidance for interpreting this result.

All of the discussion to this point has been based upon models in which union impacts on training are indirect. It is also possible that unions affect training investment directly by helping to pay for it themselves or by bargaining for it as part of the collective agreement. This might be a reasonable approach if training was perceived by members as something to which they had insufficient access on their own. The results in Table 2 reveal that unions play a very small direct funding role, taking part in

investing in a proportion of at most about 0.05 of spells of any type. Impacts through collective agreements are similarly small. The AETS contains a question on whether the training was specified as part of a collective agreement. Only a proportion of 0.0056 of trainees specify that their training was part of a collective agreement. This is in accord with earlier studies that find that unions rarely bargain directly over training.

Table 2: **Payment Sources by Training Type**

Payment Sources	All Non-union	All Union	Males Non-union	Males Union	Females Non-union	Females Union
Program Training						
Employer	0.42	0.48	0.50	0.56	0.34	0.41
Self	0.67	0.65	0.60	0.56	0.73	0.73
Government	0.12	0.13	0.114	0.12	0.11	0.14
Union	0.006	0.031	0.010	0.032	0.003	0.030
Shared	0.18	0.22	0.21	0.20	0.15	0.25
Course Training						
Employer	0.88	0.90	0.87	0.93	0.88	0.88
Self	0.16	0.16	0.17	0.093	0.15	0.22
Government	0.043	0.076	0.039	0.078	0.047	0.073
Union	0.026	0.045	0.029	0.049	0.022	0.042
Shared	0.075	0.090	0.071	0.049	0.079	0.13
General Training						
Employer	0.67	0.73	0.69	0.76	0.64	0.70
Self	0.40	0.36	0.38	0.28	0.42	0.43
Government	0.081	0.097	0.081	0.11	0.081	0.085
Union	0.019	0.053	0.019	0.056	0.020	0.051
Shared	0.13	0.15	0.14	0.11	0.12	0.18
Firm-Specific Training						
Employer	0.99	0.97	0.99	0.99	0.98	0.95
Self	0.047	0.076	0.043	0.042	0.052	0.11
Government	0.021	0.076	0.026	0.052	0.016	0.10
Union	0.018	0.021	0.033	0.028	0.003	0.015
Shared	0.041	0.069	0.043	0.041	0.040	0.097

Note: The "Shared" category consists of training jointly funded by the employer and the worker.

5. Probit Analysis of Training Incidence

The results in Tables 1 and 2 suggest that unions have some impacts both on the incidence of sub-categories of training, and on the overall training levels. In particular, unions appear to slightly reduce the incidence of general training while increasing the incidence of specific training. However, this conclusion is based upon simple tabulations. Union and non-union workers differ in observable characteristics that are themselves related to training propensity. In this section, we first present tabulations showing union/non-union differences in individual and firm characteristics and then re-examine union impacts controlling for such differences.

Table 3 shows variable means for various personal and firm characteristics, broken down by union status for the whole (men and women pooled) sample. The table reveals that there are substantial differences between union and non-union workers in many dimensions. In terms of education levels, for example, union workers are less likely to have a high school or less education and more likely to have at least some post-secondary education. The fact that the public sector in Canada is highly unionized is reflected in the fact that a proportion of approximately 0.41 of union workers are employed in the public sector compared to only 0.07 of non-union workers. Union workers are also much less likely to be employed in firms with fewer than 20 employees and much more likely to be employed in firm with over 500 employees than their non-union counterparts, though this may in part just reflect the public/private sector difference. Union workers are also more likely to be male and tend to be older, with 0.30 of union workers being of age 45 to 54 compared to only 0.19 of non-union workers. This reflects recent declines in access to unionisation among new cohorts of labour market entrants (Beaudry, Green and Townsend (2001)). Finally, the average (interrupted) years of job tenure is substantially higher for union workers, reflecting the higher job stability in the union sector that is at the heart of some of theoretical claims about how unions affect training.

Given these substantial differences in observable characteristics, we need to examine union impacts controlling for other covariates to be sure that what is being observed in Table 1 is a true union impact. To do this, we use a Probit estimator controlling for various combinations of

observable individual and firm characteristics.[7] Because the results to this point indicate substantial differences by gender, we present all of our results separately for males and females. Rather than present the estimated Probit coefficients, which do not have an interpretable magnitude, the following tables contain the derivatives of the probability of obtaining training with respect to the specified covariates along with their standard errors. For dummy variable covariates, the table entries show the impact on the probability of training from the covariate switching values from 0 to 1. For continuous variables, the entries show the effect of a marginal change in the covariate on the probability. In both cases, the effects are evaluated at the mean value of the other characteristics (and at the mean value of the variable of interest in the continuous case). Variable definitions are presented in Appendix.

Table 4 presents results for males in which the dependent variable is a dummy variable corresponding to overall training (i.e., either programme or course training related to current or future employment). The first column specification contains includes union status (whether the individual was covered by a collective agreement) and a constant as its only covariates. This demonstrates a union impact of the same order of magnitude as was observed in Table 1: unions increase the incidence of training among males by about one percentage point relative to a non-union average of 28%. The column two specification adds in covariates related to education and age. The education covariates are intended to pick up the extent to which formal schooling alters the costs and benefits of obtaining further education and training. The estimates indicate that more educated workers obtain substantially more and less educated workers obtain less training than those whose highest level of education is high school graduation (the base group). This fits either with formal schooling and further training being complements in production and/or formal schooling reducing the costs of further training, perhaps because those with more schooling have "learned how to learn." The age variables reveal a strong pattern in which younger individuals have much higher training rates than older individuals, as one would predict in models of rational investment in training. Most importantly from our perspective, adding these variables strengthens a bit the union status impact on training, making it statistically significant. In column 3 we add a variable corresponding to whether the individual had managerial responsibilities to the specification to find out whether managers are more or less likely to get trained. The estimated coefficient indicates that male

[7] We reran the models using a logit model and found very similar results.

workers with managerial or supervisory responsibilities are substantially more likely to obtain training than those without and adding this variable increases the union impact variable by another percentage point.

In the remaining columns of Table 4 we investigate the impacts of sector, firm size, seniority and province. In column 4, we add in a set of dummy variables for public sector employment and firm size as well as years of tenure and years of tenure squared.[8] We add the firm size variables because of results in earlier work showing a correlation between firm size and training incidence, and because of the strong correlation between firm size and union status shown in Table 3. The public sector variable is included to control for the possibility that training is done differently in the public and private sectors and to allow for purer estimates of the firm size effect. Years of tenure are introduced to capture two potential effects. The first effect is that training is expected to take place early on the job for the standard reasons given by human capital theory (maximize the number of periods for which the training will be productive). This effect is consistent with wage studies that show that the effect of tenure is larger early in the job (concave effect of tenure on wages), suggesting that most productive training takes place early on. The other potential effect is that in the case of specific capital, firm may prefer to invest in more senior workers who are less likely to turnover than workers who just joined in. Since these two effects go in opposite directions, the effect of tenure on training is ambiguous.

The results indicate that male public sector workers are substantially more likely to obtain training than their private sector counterparts. The estimated firm size effects reveal a clear pattern of training increasing with firm size. This fits with results from earlier papers. It also causes the union effect to move from significantly positive to significantly negative, indicating that some positive perceived union effects on training are really just disguised firm size effects. The effect of tenure is not significant, indicating that the two above discussed effects may indeed be offsetting each other. In the final column, we add a set of nine industry dummy variables and nine provincial dummy variables to the specification. This changes the magnitude of the other estimated coefficients very little and does not change the implications drawn

[8] We use a quadratic specification for years of tenure with the firm by analogy with the wage studies that typically find a positive but declining (negative coefficient on the squared term) effect of tenure on wages.

from those coefficients at all. The union impact for males remains negative and significant though smaller (in absolute value) than in column 4.

As we saw in Table 1, patterns for overall training incidence can hide larger differences within specific training categories. In Table 5, we re-estimate the most complete specification from Table 4 for males for four different training status dependent variables. The first column contains the results using programme training as our dependent variable. The estimates again indicate some positive relationship between education and programme training, though that relationship is not monotonic. In particular, male post-secondary graduates and university graduates do less training of this type than do those with some (but not completed) post-secondary education. Since programme training really corresponds to going back to school, this result is not surprising: individuals with a university education need to get less new education because they already have a high level. The age variables again indicate a strong negative relationship between age and training, and a positive impact of being in the public sector on training. Interestingly, there is no clear relationship between firm size and training. This may fit with the claim that programme training is true general human capital training that occurs off the firm site: there is no reason to believe that larger firms have a comparative advantage in providing such training. Nonetheless, this result is somewhat surprising because in models in which firms help pay for general human capital investment, increased job stability should lead to higher investment levels, and larger firms tend to have more job stability. Interestingly, years of tenure have a negative and significant (though declining) effect on training, which is consistent with standard human capital theory. Including all of these covariates dramatically reduces the size of the union impact on programme training. Table 1 indicated that unionized males obtained approximately 3 percentage points less programme training than non-union males. However, the results from column 1 indicate that training rates are essentially the same for union and non-union males once one controls for other characteristics. Thus, the evidence that unions lead to a reduction in general human capital investment is not strong.

In column 2, we present results from the same specification with a dummy variable corresponding to course training as the dependent variable. We argued earlier that course training could be viewed as providing a relatively broad definition of firm specific training. For training of this type, education again has a strong and positive effect on training for males. Interestingly, the effects of age are no longer as

clear, with all age groups below age 55 having quite similar training rates. This appears to indicate that as long as there is at least ten years of an individual's working life left, firms and workers believe it is worth while continuing to invest in this type of training. While this is a reasonable use of training, the fact that it does not decline at all with age below 55 years old is surprising. In contrast to programme training, firm size shows up with a strong pattern, positively related to course training. Tenure has a positive and declining effect on course training, which doesn't fit well with standard human capital theory but does fit with the idea that firms may wait to be sure a worker will stay with the firm before investing. The impact of adding these controls is quite dramatic. The union effect on course training goes from positive 3 percentage points in Table 1 to negative 3 percentage points in this table.

Column 3 contains results using our second definition of general human capital, which includes both programme training and any course training not provided by the employer. The results using this definition are quite similar to those presented in column 1 except of the effect of tenure which is now positive but not significant. The union impact estimated with the second definition of general training is again negative and larger than that estimated with the first definition, though still not very substantial.

Finally, column 4 contains estimates using our more restricted definition of firm specific training: course training that is directly provided by the employer. The patterns again indicate positive education effects but, as in column 2, there is no clear age pattern. There is again a relatively clear firm size pattern but a weaker tenure effect. The union impact is both economically insubstantial and statistically insignificant. If we use column 1 as our most precise definition of general human capital training and column 4 as our most precise definition of firm specific training then the conclusion from Table 5 is that unionisation has essentially no impacts on either general or firm specific human capital investment for males once one controls for other covariates. Further investigation indicates that the sizeable reduction in the union impact on programme training witnessed in Table 5 relative to Table 1 arises primarily because of the introduction of controls for age, which has negative effects on training and is positively related to union status. In contrast, the reduction in the impact of unionisation on firm specific training stems mainly from the introduction of firm size variables.

The results in Table 5 may hide large differences in union impacts for various sub-groups of workers in the economy. To check this, we estimate a specification in which we interact the union status variable

with all the other covariates. In Table 6, we present the coefficients from these interaction terms. Thus, the reported coefficients represent the male union impact and how it varies with observable worker characteristics for our various definitions of general and firm specific human capital investment.[9] The first row of the table contains the coefficient on the union dummy variable itself. This corresponds to the impact of unionisation for the base group: a non-union, private sector, 25 to 34 year old male worker with a high school diploma, who has no managerial responsibilities and who works in a firm with more than 500 employees in the manufacturing sector in Ontario. The remaining rows show how the union effect varies for individuals who are the same as the base person apart from changing the value for the covariate named in the first column from zero to one. Thus, the UNIV row shows the difference in the union effect between the base person and a person who is identical to the base person except that they have a university degree rather than a high school diploma as their education level. The first column contains the union impacts on the probability of obtaining programme training. The base person has a larger union impact than represented in Table 5 where unionisation effects are not allowed to vary by person type. The remaining rows in column 1 represent very sporadic results. There is no clear pattern with respect to age, education or firm size. The only clear conclusion is that there is less programme training for males in the manufacturing sector (the base industry) than virtually any other industry. For course training, in column 2, there is again little evidence of any strong patterns in the union effect. There is some evidence, however, that unions have larger impacts in smaller firms (less than 20 employees). This is consistent with what Green (1993) found in British data. The alternative definitions of general and firm specific training again show little in the way of consistent patterns in the union effect across covariate groups except for a positive union effect for smaller firms.

Results from the same exercises for females are presented in Tables 7-9. In Table 7, we recreate the exercise from Table 4 in which we introduce sequentially a set of covariates to investigate the impact of controlling for them upon our union effect estimate. For males, this exercise ultimately had very little impact on the estimated union effect. However, for females, introducing the covariates reduces the impact of unionisation on overall training from 0.080 to 0.036. The latter estimate is very similar to that found for males, suggesting that the large differences between males and females in the first row of Table

[9] Full results including estimated coefficients for the covariates not interacted with union status are not reported to save on space. They are available from the authors upon request.

1 arise from differences in the distributions of observable covariates between males and females. The patterns in training relative to the other observed characteristics are quite similar to those found for males: both education and firm size have positive effects on training, while age has a negative impact. In Table 8, we present the results of probits estimated with different definitions of general and firm specific training as the dependent variables for females. As for males, the union impact is small and negative both for programme and course training. The alternative human capital investment measures also yield similar conclusions for females than for males. In particular, the negative impact of unionisation on general training is negative and statistically significant, while the impact of unionisation on firm specific training is not statistically significant.

Finally, in Table 9, we recreate the exercise of investigating variation in estimated union impacts for females. For both measures of general human capital investment, unionisation has strong positive effects on training for the base person type. This appears to arise primarily because female workers in manufacturing have more general human capital investment than workers in most other industries and than female workers in the public sector. Otherwise, as with males, it is hard to argue that there are strong, consistent patterns in the way union effects vary with covariates except for the fact that the union effect is usually larger in smaller firms. This is essentially true as well for the definitions of firm specific investments, though there is some evidence of unions having more positive impacts on course training in smaller firms.

Overall, once one controls for the impacts of other covariates, the impacts of unions on training are generally small for both males and females. The only exception is the broader measure of general training for which the union impact is negative and significant for both men and women.

Table 3: **Personal and Firm Characteristics by Union Status**

Characteristics	Non-union	Union
Education		
Elem. or Some High School	0.17	0.15
High School Graduate	0.24	0.18
Some Post-Secondary	0.09	0.08
Completed Post-Secondary	0.33	0.37
University	0.17	0.22
Public Sector	0.07	0.41
Firm Size		
Less Than 20 Employees	0.34	0.058
20 to 99 Employees	0.21	0.12
100 to 199 Employees	0.068	0.077
200 to 499 Employees	0.077	0.11
500 or More Employees	0.31	0.64
Female	0.49	0.45
Age		
17 to 19	0.025	0.008
20 to 24	0.12	0.046
25 to 34	0.31	0.24
35 to 44	0.29	0.32
45 to 54	0.19	0.30
55 to 64	0.079	0.099
Average Job Tenure (Years)	5.6	10.1

Table 4: **Simple Probit Results for Training Status, Males**

Variable	1	2	3	4	5
UNION	0.007 (0.010)	0.021 (0.011)*	0.036 (0.011)*	-0.041(0.012)*	-0.030 (0.013)*
ELEMSHS	-	-0.087 (0.016)*	-0.082 (0.016)*	-0.059 (0.017)*	-0.044 (0.017)*
SOMEPS	-	0.17 (0.024)*	0.16 (0.024)*	0.17 (0.024)*	0.18 (0.024)*
PSGRAD	-	0.14 (0.015)*	0.13 (0.015)*	0.13 (0.015)*	0.14 (0.016)*
UNIV	-	0.25 (0.018)*	0.22 (0.018)*	0.19 (0.019)*	0.21 (0.020)*
AG1719	-	0.26 (0.042)*	0.28 (0.041)*	0.30 (0.042)*	0.32 (0.042)*
AG2024	-	0.080 (0.020)*	0.088 (0.021)*	0.11 (0.021)*	0.12 (0.022)*
AG3544	-	-0.005 (0.013)	-0.013 (0.013)	-0.032(0.013)*	-0.037 (0.013)*
AG4554	-	-0.024 (0.014)	-0.039 (0.014)*	-0.068(0.015)*	-0.075 (0.015)*
AG5564	-	-0.110 (0.017)*	-0.12 (0.016)*	-0.13 (0.016)*	-0.14 (0.016)*
MANGR	-	-	0.11 (0.012)*	0.090 (0.012)*	0.079 (0.012)*
PUBLIC	-	-	-	0.090 (0.016)*	-0.030 (0.020)*
FLT20	-	-	-	-0.13 (0.013)*	-0.13 (0.013)*
F2099	-	-	-	-0.086 (0.013)*	-0.069 (0.014)*
F100199	-	-	-	-0.051 (0.018)*	-0.041 (0.019)*
F200499	-	-	-	-0.041 (0.017)*	-0.031 (0.018)
TENURE/10	-	-	-	0.045 (0.030)	0.044 (0.030)
TENSQ/100	-	-	-	-0.013 (0.015)	-0.010 (0.015)
INDUSTRY DUMMIES	NO	NO	NO	NO	YES
PROVINCE DUMMIES	NO	NO	NO	NO	YES
Observ. Prob	0.28	0.28	0.28	0.28	0.28
Fitted Prob.	0.28	0.27	0.27	0.26	0.26
PSEUDO R^2	0.0001	0.056	0.066	0.087	0.109
# OF OBS	8,074	8,074	8,074	8,074	8,751

Note: Standard errors in parentheses. The table entries correspond to probability derivatives. For each dummy covariate, the table shows the change in the probability of being trained due to switching the covariate value from 0 to 1. The derivatives are calculated for the base person: a non-union, private sector, 25 to 34 year old worker with a high school diploma, who has no managerial responsibilities and who works in a firm with more than 500 employees in the manufacturing sector in Ontario. The Fitted Probability is also for this base person.

* mean effect is significantly different from zero at the 5% significance level.

Table 5: **Probit Results for Different Types of Training, Males**

Variable	Programme Training	Course Training	General Training	Firm Spec. Training
UNION	-0.003 (0.0064)	-0.027 (0.011)*	-0.022 (0.011)*	-0.0054 (0.0067)
ELEMSHS	-0.007 (0.009)	-0.040 (0.015)*	-0.024 (0.016)*	-0.017 (0.007)*
SOMEPS	0.094 (0.018)*	0.100 (0.022)*	0.172 (0.024)*	0.005 (0.011)
PSGRAD	0.065 (0.010)*	0.085 (0.014)*	0.129 (0.015)*	0.015 (0.007)*
UNIV	0.075 (0.014)*	0.145 (0.018)*	0.189 (0.019)*	0.018 (0.009)*
AG1719	0.25 (0.039)*	0.015 (0.040)	0.287 (0.043)*	0.026 (0.027)*
AG2024	0.073 (0.013)*	0.025 (0.019)	0.122 (0.020)*	-0.013 (0.010)
AG3544	-0.032 (0.006)*	0.0033 (0.012)	-0.035 (0.011)*	-0.0003 (0.006)
AG4554	-0.063 (0.005)*	-0.0027 (0.014)	-0.072 (0.012)*	-0.002 (0.007)
AG5564	-0.063 (0.004)*	-0.059 (0.016)*	-0.126 (0.012)*	-0.005 (0.009)
MANGR	-0.0004 (0.0058)	0.085 (0.011)*	0.048 (0.010)*	0.025 (0.006)*
PUBLIC	0.0066 (0.0108)	-0.021 (0.017)	-0.016 (0.018)	-0.010 (0.008)
FLT20	0.010 (0.008)	-0.135 (0.010)*	-0.043 (0.013)*	-0.062 (0.005)*
F2099	0.012 (0.008)	-0.073 (0.011)*	0.003 (0.013)	-0.045 (0.005)*
F100199	0.007 (0.011)	-0.034 (0.015)*	0.015 (0.018)	-0.029 (0.006)*
F200499	0.025 (0.012)*	-0.048 (0.014)*	0.017 (0.017)	-0.028 (0.005)*
TENURE/10	-0.058 (0.016)*	0.107 (0.026)*	0.004 (0.026)	0.024 (0.014)+
TEN^2/100	0.029 (0.008)*	-0.042 (0.013)*	0.003 (0.013)	-0.009 (0.007)
INDUSTRY DUMMIES	YES	YES	YES	YES
PROVINCE DUMMIES	YES	YES	YES	YES
Observed Prob.	0.085	0.21	0.21	0.078
Fitted Prob.	0.067	0.18	0.18	0.051
PSEUDO R^2	0.058	0.12	0.21	0.13
# OF OBS	8,074	8,074	8,074	8,074

Note: Standard errors in parentheses. The table entries correspond to probability derivatives. For each dummy variable covariate, the table shows the change in the probability of being trained due to switching the covariate value from 0 to 1. The derivatives and the Fitted Probabilities are calculated for the base person described at the bottom of Table 4.

* mean effect is significantly different from zero at the 5% significance level.

Table 6: **Union Effects on Training Outcomes by Observable Characteristics, Males: Impacts from Interactions of Union Status with Various Variables**

Variable	Programme Training	Course Training	General Training	Firm Spec. Training
BASE	-0.025 (0.022)	-0.008 (0.040)	-0.058 (0.039)	0.015 (0.022)
ELEMSHS	0.032 (0.027)	-0.029 (0.031)	0.032 (0.038)	-0.013 (0.014)
SOMEPS	-0.050 (0.005)*	-0.028 (0.040)	-0.044 (0.032)	-0.018 (0.014)
PSGRAD	-0.001 (0.016)	-0.001 (0.026)	0.016 (0.028)	-0.009 (0.012)
UNIV	-0.010 (0.016)	-0.038 (0.027)	-0.006 (0.022)	-0.022 (0.011)+
AG1719	0.024 (0.043)	a	0.040 (0.082)	a
AG2024	0.026 (0.025)	0.002 (0.043)	0.080 (0.047)+	-0.020 (0.018)
AG3544	0.021 (0.017)	0.006 (0.025)	0.002 (0.026)	0.022 (0.016)
AG4554	0.046 (0.028)*	0.023 (0.030)	0.039 (0.033)	0.017 (0.018)
AG5564	0.140 (0.084)*	0.0004 (0.040)	0.028 (0.047)	-0.002 (0.019)
MANGR	-0.002 (0.012)	-0.033 (0.018)+	-0.009 (0.020)	-0.012 (0.008)*
PUBLIC	-0.053 (0.010)*	-0.015 (0.038)	-0.076 (0.032)*	0.004 (0.021)
FLT20	0.008 (0.022)	0.128 (0.051)*	0.127 (0.048)*	0.021 (0.033)*
F2099	0.011 (0.019)	0.0002 (0.030)	0.032 (0.032)	0.004 (0.018)*
F100199	0.014 (0.025)	0.041 (0.040)	0.067 (0.043)	0.0116 (0.023)*
F200499	-0.009 (0.016)	0.079 (0.039)*	0.047 (0.037)	0.031 (0.024)*
TENURE/10	-0.067 (0.033)	-0.018 (0.055)	-0.071 (0.057)	-0.012 (0.028)
TENSQ/100	0.033 (0.016)	-0.018 (0.026)	0.028 (0.027)	-0.009 (0.013)
AGR	-0.027 (0.058)	-0.167 (0.036)*	-0.167 (0.039)	a
PRIM	0.004 (0.037)	0.006 (0.055)	0.051 (0.064)	-0.028 (0.014)
NONDUR	0.077 (0.041)*	-0.035 (0.034)	0.011 (0.040)	-0.004 (0.018)
CONSTR	-0.010 (0.025)	0.101 (0.062)+	0.034 (0.052)	0.059 (0.059)
TRANS	0.051 (0.036)+	0.055 (0.042)	0.002 (0.039)	0.050 (0.029)*
SALES	0.109 (0.052)*	-0.048 (0.036)	-0.019 (0.040)	0.028 (0.032)
BUSSERV	0.104 (0.050)*	0.039 (0.049)	0.084 (0.053)+	0.035 (0.034)
PSERV	0.100 (0.043)*	0.002 (0.037)	0.049 (0.042)	0.026 (0.025)
PADMIN	0.210 (0.089)*	0.111 (0.071)+	0.130 (0.074)*	0.042 (0.042)
PROVINCE DUMMIES	YES	YES	YES	YES
Observed Prob.	0.085	0.21	0.21	0.078
Fitted Prob.	0.054	0.180	0.184	0.079
PSEUDO R^2	0.153	0.128	0.092	0.144
# OF OBS	8,057	8,054	8,057	8,040

Note: Standard errors in parentheses. The table entries correspond to probability derivatives. For each dummy variable covariate, the table shows the change in the probability of being trained due to switching the covariate value from 0 to 1. The derivatives and the Fitted Probabilities are calculated for the base person described at the bottom of Table 4.

*, + mean effect is significantly different from zero at the 5% and 10% significance level, respectively.

a: coefficient could not be estimated because of the small number of union workers with the corresponding characteristic.

Table 7: **Simple Probit Results for Training Status, Females**

Variable	1	2	3	4	5
UNION	0.080 (0.011)*	0.060 (0.011)*	0.069 (0.011)*	-0.020(0.013)	-0.036 (0.013)*
ELEMSHS	-	-0.120 (0.017)*	-0.109 (0.017)*	-0.088 (0.018)*	-0.073 (0.019)*
SOMEPS	-	0.123 (0.022)*	0.122 (0.022)*	0.111 (0.022)*	0.093 (0.022)*
PSGRAD	-	0.155 (0.014)*	0.153 (0.014)*	0.154 (0.015)*	0.140 (0.015)*
UNIV	-	0.260 (0.018)*	0.247 (0.018)*	0.219 (0.018)*	0.193 (0.019)*
AG1719	-	0.174 (0.045)*	0.185 (0.046)*	0.202 (0.046)*	0.235 (0.047)*
AG2024	-	0.076 (0.021)*	0.086 (0.021)*	0.103 (0.022)*	0.128 (0.023)*
AG3544	-	-0.004 (0.013)	-0.005 (0.013)	-0.019 (0.013)*	-0.027 (0.013)*
AG4554	-	0.001 (0.014)	-0.003 (0.014)	-0.018 (0.015)*	-0.027 (0.015)+
AG5564	-	-0.109 (0.018)*	-0.115 (0.018)*	-0.112 (0.019)*	-0.124 (0.018)*
MANGR	-	-	0.131 (0.012)*	0.119 (0.013)*	0.109 (0.013)*
PUBLIC	-	-	-	0.093 (0.015)*	0.051 (0.018)*
FLT20	-	-	-	-0.162 (0.012)*	-0.152 (0.013)*
F2099	-	-	-	-0.059 (0.014)*	-0.058 (0.014)*
F100199	-	-	-	-0.030 (0.020)	-0.029 (0.020)
F200499	-	-	-	-0.009 (0.018)	-0.002 (0.018)
TENURE/10				0.020 (0.029)	0.002 (0.029)
TENSQ/100				-0.007 (0.014)	0.001 (0.014)
INDUSTRY DUMMIES	NO	NO	NO	NO	YES
PROVINCE DUMMIES	NO	NO	NO	NO	YES
Observ. Prob	0.31	0.30	0.29	0.29	0.28
Fitted Prob.	0.31	0.30	0.29	0.29	0.28
PSEUDO R^2	0.0054	0.059	0.071	0.094	0.116
# OF OBS	8,608	8,608	8,608	8,608	8,608

Note: Standard errors in parentheses. The table entries correspond to probability derivatives. For each dummy covariate, the table shows the change in the probability of being trained due to switching the covariate value from 0 to 1. The derivatives are calculated for the base person: a non-union, private sector, 25 to 34 year old worker with a high school diploma, who has no managerial responsibilities and who works in a firm with more than 500 employees. The Fitted Probability is also for this base person.

*, + mean effect is significantly different from zero at the 5% and 10% significance level, respectively.

Table 8: **Probit Results for Different Types of Training, Females**

Variable	Programme Training	Course Training	General Training	Firm Spec. Training
UNION	-0.006 (0.007)	-0.025 (0.011)	-0.044 (0.012)*	0.006 (0.006)
ELEMSHS	-0.003 (0.012)	-0.068 (0.016)*	-0.053 (0.017)*	-0.020 (0.008)*
SOMEPS	0.075 (0.017)*	0.039 (0.019)*	0.081 (0.021)*	0.013 (0.010)
PSGRAD	0.076 (0.010)*	0.076 (0.013)*	0.128 (0.014)*	0.009 (0.006)
UNIV	0.093 (0.015)*	0.123 (0.017)*	0.175 (0.018)*	0.012 (0.008)
AG1719	0.185 (0.040)*	0.033 (0.045)	0.223 (0.046)*	-0.024 (0.019)*
AG2024	0.117 (0.016)*	-0.052 (0.017)*	0.101 (0.020)*	0.008 (0.011)
AG3544	-0.024 (0.006)*	0.007 (0.012)	-0.034 (0.011)*	0.009 (0.006)
AG4554	-0.035 (0.007)*	0.012 (0.014)	-0.044 (0.013)*	0.013 (0.007)+
AG5564	-0.062 (0.006)*	-0.052 (0.017)*	-0.113 (0.015)*	-0.0002 (0.010)
MANGR	0.002 (0.007)	0.110 (0.011)*	0.074 (0.011)*	0.023 (0.006)*
PUBLIC	0.0005 (0.0090)*	0.042 (0.015)*	0.017 (0.015)*	0.021 (0.008)*
FLT20	-0.026 (0.007)*	-0.129 (0.010)*	-0.071 (0.012)*	-0.064 (0.005)*
F2099	-0.010 (0.007)	-0.052 (0.012)*	-0.008 (0.013)	-0.028 (0.005)*
F100199	-0.015 (0.010)	-0.007 (0.017)	-0.009 (0.018)	-0.004 (0.005)
F200499	-0.011 (0.009)	0.013 (0.016)	0.006 (0.017)	-0.001 (0.007)
TENURE/10	-0.078 (0.016)*	0.087 (0.025)*	-0.081 (0.026)*	0.048 (0.012)*
TEN^2/100	0.024 (0.008)*	-0.032 (0.012)*	0.042 (0.013)*	-0.024 (0.006)*
INDUSTRY DUMMIES	YES	YES	YES	YES
PROVINCE DUMMIES	YES	YES	YES	YES
Observed Prob.	0.095	0.233	0.23	0.081
Fitted Prob.	0.067	0.193	0.21	0.048
PSEUDO R^2	0.126	0.137	0.088	0.137
# OF OBS	8,608	8,608	8,608	8,608

Note: Standard errors in parentheses. The table entries correspond to probability derivatives. For each dummy variable covariate, the table shows the change in the probability of being trained due to switching the covariate value from 0 to 1. The derivatives and the Fitted Probabilities are calculated for the base person described at the bottom of Table 4.

*, + mean effect is significantly different from zero at the 5% and 10% significance level, respectively.

Table 9: **Union Effects on Training Outcomes by Observable Characteristics, Females Impacts from Interactions of Union Status with Various Variables**

Variable	Programme Training	Course Training	General Training	Firm Spec. Training
BASE	0.072 (0.042)*	0.011 (0.055)	0.172 (0.062)*	-0.050 (0.023)*
ELEMSHS	-0.031 (0.020)	0.028 (0.041)	0.030 (0.047)	-0.012 (0.014)*
SOMEPS	-0.018 (0.020)	0.025 (0.037)	-0.006 (0.041)	0.030 (0.023)
PSGRAD	-0.020 (0.015)	0.015 (0.026)	-0.007 (0.028)	-0.003 (0.010)
UNIV	-0.013 (0.018)	-0.009 (0.029)	0.002 (0.033)	-0.015 (0.009)
AG1719	-0.043 (0.026)	0.050 (0.146)	-0.110 (0.075)	0.960 (0.026)*
AG2024	-0.004 (0.020)	-0.017 (0.046)	-0.004 (0.042)	-0.010 (0.017)
AG3544	-0.020 (0.012)	0.006 (0.025)	-0.010 (0.025)	0.004 (0.011)
AG4554	-0.032 (0.012)	0.060 (0.032)*	-0.030 (0.027)	0.053 (0.021)*
AG5564	0.014 (0.039)	0.042 (0.047)	0.093 (0.055)*	-0.019 (0.011)
MANGR	0.037 (0.018)*	-0.052 (0.018)*	0.015 (0.023)	-0.022 (0.005)*
PUBLIC	-0.024 (0.015)	0.032 (0.034)	0.012 (0.034)	-0.007 (0.012)
FLT20	0.046 (0.034)	0.105 (0.049)*	0.174 (0.051)*	0.002 (0.025)
F2099	0.019 (0.021)	0.084 (0.035)*	0.058 (0.034)+	0.059 (0.023)*
F100199	-0.001 (0.023)	-0.033 (0.032)	-0.027 (0.035)	0.009 (0.017)
F200499	0.011 (0.022)	-0.066 (0.024)*	-0.066 (0.027)*	0.002 (0.013)
TENURE/10	-0.015 (0.032)	-0.028 (0.052)	-0.085 (0.055)	0.014 (0.021)
TENSQ/100	0.018 (0.017)	0.019 (0.025)	0.020 (0.027)	-0.013 (0.021)
AGR	0.033 (0.129)	-0.079 (0.171)	-0.014 (0.180)	[a]
PRIM	[a]	0.065 (0.221)	[a]	0.808 (0.214)*
NONDUR	-0.062 (0.007)*	-0.118 (0.038)*	-0.185 (0.017)*	0.023 (0.053)
CONSTR	-0.008 (0.086)	[a]	-0.169 (0.059)	[a]
TRANS	-0.037 (0.019)	-0.053 (0.049)	-0.134 (0.032)*	0.114 (0.082)*
SALES	-0.057 (0.009)*	-0.035 (0.054)	-0.158 (0.025)*	0.089 (0.075)
BUSSERV	-0.044 (0.015)+	-0.054 (0.048)	-0.127 (0.33)*	0.046 (0.054)
PSERV	-0.045 (0.020)+	-0.007 (0.050)	-0.126 (0.038)*	0.084 (0.055)*
PADMIN	-0.027 (0.027)	-0.004 (0.066)	-0.160 (0.029)*	0.210 (0.115)*
PROVINCE DUMMIES	YES	YES	YES	YES
Observed Prob.	0.095	0.233	0.230	0.081
Fitted Prob.	0.066	0.193	0.207	0.040
PSEUDO R^2	0.133	0.140	0.092	0.156
# OF OBS	8,584	8,603	8,584	8,596

Note: Standard errors in parentheses. The table entries correspond to probability derivatives. For each dummy variable covariate, the table shows the change in the probability of being trained due to switching the covariate value from 0 to 1. The derivatives and the Fitted Probabilities are calculated for the base person described at the bottom of Table 4.

*, + mean effect is significantly different from zero at the 5% and 10% significance level, respectively.

a: coefficient could not be estimated because of the small number of union workers with the corresponding characteristic.

6. Probit Estimates of Source of Payment

As with the study of the incidence of training, correlations between unionisation status and other covariates raise questions of whether simple tabulations of union impacts on the sources of payment for training reflect true union impacts. Again, we wish to control for other covariates and re-estimate the union impact. To do this, we run the same specification as was used in Tables 5 and 8 but use two new dependent variables: 1) a dummy variable corresponding to whether an employer helped pay for the training; and 2) a dummy variable equal to one if the individual helped pay for the training but the employer did not. The first dependent variable is intended to capture any employer involvement in financing training. The second focuses on individual contributions, though in some cases there is also involvement from other agents such as the government. We examine sources of payment for our two definitions of general human capital and one (all courses) definition of specific human capital. The number of observations for whom we observed specific human capital investment defined as training provided by the employer was too small to allow us to generate stable results and so we do not report any results based on this second specific human capital definition.

Table 10 contains estimated probability derivatives calculated using estimated coefficients from a probit with the first dependent variable. The first column contains results based only on males who reported taking programme training. Recall that the results in Table 2 indicate that unionized employers are more likely to pay for such training than are non-union employers. This result appears to hold up once one controls for other covariates, although the union differential is both smaller than in Table 2 and not statistically significant. The other coefficients indicate that employers are more likely to help pay for general training defined in this way when workers are older and when they have some managerial responsibility. Employers also seem to play less of a direct payment role in smaller firms, although the relationship between employer payment and firm size is not a simple, monotonic function. Tenure has a large and positive (but declining) effect, which is consistent with employers investing in more stable workers. Results using the broader definition of general human capital, given in column 3, are very similar. According to the course based definition of firm specific training, firms also play a greater funding role in this type of investment in the union versus the non-union sector. There is no evidence of a

significant age effect on employer payment for this type of training. Tenure has a positive though smaller effect than in the case of programme training.

Table 11 contains the derivatives of the probability that the individual alone (without the help of the firm) pays for the investment with respect to our various covariates. In this case, for programme training there is no evidence of a substantial relationship between union status and self-payment for training. The same result holds for the alternative definition of general training in column 3. In terms of other covariates, the results are just the opposite of those for employer contributions: older workers and managerial workers are both less likely to contribute to their own general training, while tenure has a negative effect. The same patterns hold true for investment in course training in column 2. Here, though, the union effect is negative and statistically significant.

Tables 12 and 13 repeat the exercises represented in Tables 10 and 11 for females. The estimates of employer contributions to training for females in Table 12 indicate union impacts that are economically smaller than those for males. For example, the 6 percentage point raw difference in the proportion of general human capital training (defined using the second definition) between union and non-union females shown in Table 2 declines to a -2 percentage point difference after controlling for covariates. In terms of worker payment for training, Table 13 indicates that unionisation leads to a decline in such payment for general training but a statistically significant increase for specific training. Overall, the results of these exercises indicate that unions have little impact on the involvement of firms and workers in paying for both general and firm specific training while leading to a decline in the proportion of workers investing in firm specific training.

Once one controls for other covariates, then, our results paint slightly different pictures for men and women. For both men and women, unionisation is related to small decreases in either general of firm specific human capital investment. There is also weak evidence that unions generate greater employer involvement in payment for both general and firm specific human capital for men. Thus, unionisation appears to shift the means of payment more than the amount of investment for men. This fits with the kinds of models in which union pay structures lead to unionized firms taking a greater role in funding general human capital investment but do not necessarily change the amount of investment. To explain the small declines in general human capital investment, one could then graft onto these types of model the

type of distinction between alternative human capital (useful only outside the firm) and general human capital (useful both inside and outside the current firm) proposed by Kuhn and Sweetman. In that case, more stable union work arrangements could lead to lower investment by workers while firms play an expanded role in funding general human capital. The finding that tenure has a positive effect on whether employers pay for training is quite consistent with this view. In that case, one would also expect to see the proportion of non-specific training spells funded by workers alone decrease as firms expand their role while workers invest less in alternative human capital. The negative effect of tenure on the probability of workers paying for training alone is quite consistent with this view.

For women, the results again indicate small and negative effects of unionisation on both general and firm specific human capital investment. Both of these effects are more or less comparable to similar estimated effects for men. In terms of payment, unionisation appears to have little impact on the proportion of spells in which firms help in the funding but it does have negative (though not significant) effects on the proportion of general human capital training invested in by workers alone. As in the case of men, the most robust result is that employer involvement in training increases with tenure while the opposite happens to workers involvement.

Table 10: **Probit Results for Whether Employer Paid for Training, Males**

Variable	Programme Training	Course Training	General Training
UNION	0.042 (0.062)	0.023 (0.015)	0.022 (0.028)
ELEMSHS	-0.310 (0.088)*	0.040 (0.014)*	-0.048 (0.053)
SOMEPS	-0.235(0.086)*	-0.011 (0.026)	-0.119 (0.054)*
PSGRAD	-0.244 (0.080)*	0.001 (0.018)	-0.082 (0.039)*
UNIV	-0.303 (0.086)*	-0.001 (0.020)	-0.096 (0.045)*
AG1719	0.045 (0.098)	0.021 (0.033)	-0.050 (0.066)*
AG2024	-0.090 (0.067)	0.005 (0.021)	-0.060 (0.039)*
AG3544	0.077 (0.068)	-0.010 (0.015)	0.039 (0.029)*
AG4554	0.033 (0.107)	-0.012 (0.019)	0.012 (0.039)*
AG5564	0.383 (0.105)*	-0.007 (0.030)	0.097 (0.052)*
MANGR	0.287 (0.050)*	0.073 (0.025)*	0.211 (0.022)*
PUBLIC	-0.046 (0.113)	-0.036 (0.028)	-0.046 (0.052)
FLT20	0.004 (0.070)	-0.065 (0.029)*	-0.050 (0.037)
F2099	0.018 (0.069)	-0.019 (0.020)	0.005 (0.032)
F100199	-0.033 (0.111)	-0.028 (0.027)	0.006 (0.046)
F200499	0.194 (0.081)*	0.019 (0.020)	0.106 (0.033)*
TENURE/10	0.882 (0.160)*	0.173 (0.035)*	0.582 (0.071)*
TENSQ/100	-0.319 (0.087)*	-0.058 (0.018)*	-0.203 (0.037)*
!NDUSTRY DUMMIES	YES	YES	YES
PROVINCE DUMMIES	YES	YES	YES
Observed Prob.	0.52	0.90	0.72
Fitted Prob.	0.54	0.94	0.79
PSEUDO R^2	0.307	0.212	0.275
# OF OBS	633	1,765	1,644

Note: Standard errors in parentheses. The table entries correspond to probability derivatives. For each dummy variable covariate, the table shows the change in the probability of being trained due to switching the covariate value from 0 to 1. The derivatives and the Fitted Probabilities are calculated for the base person described at the bottom of Table 4.

* mean effect is significantly different from zero at the 5% significance level.

Table 11: **Probit Results for Whether Worker Alone Paid for Training, Males**

Variable	Programme Training	Course Training	General Training
UNION	-0.056 (0.054)	-0.025 (0.011)*	-0.034 (0.022)
ELEMSHS	0.142 (0.101)	-0.026 (0.011)	-0.003 (0.041)
SOMEPS	0.227 (0.089)*	0.011 (0.021)	0.100 (0.048)*
PSGRAD	0.233 (0.077)*	0.001 (0.014)	0.065 (0.033)*
UNIV	0.349 (0.088)*	0.07 (0.016)*	0.101 (0.040)*
AG1719	-0.008 (0.088)	-0.012 (0.025)	0.019 (0.051)
AG2024	0.077 (0.062)	-0.007 (0.014)	0.043 (0.032)
AG3544	-0.088 (0.059)	0.002 (0.011)	-0.039 (0.023)+
AG4554	-0.103 (0.092)	-0.022 (0.012)+	-0.097 (0.026)*
AG5564	-0.315 (0.051)*	-0.035 (0.009)*	-0.134 (0.023)*
MANGR	-0.206 (0.045)*	-0.040 (0.009)*	-0.104 (0.019)*
PUBLIC	0.030 (0.106)	0.070 (0.029)*	0.064 (0.046)
FLT20	-0.041 (0.062)	0.021 (0.019)	0.003 (0.028)
F2099	-0.052 (0.061)	0.008 (0.014)	-0.022 (0.025)
F100199	-0.037 (0.093)	-0.0003 (0.017)	-0.038 (0.034)
F200499	-0.148 (0.068)+	-0.015 (0.013)	-0.079 (0.026)*
TENURE/10	-0.673 (0.148)*	-0.154 (0.029)*	-0.474 (0.060)*
TENSQ/100	0.270 (0.081)*	0.058 (0.014)*	0.185 (0.032)*
INDUSTRY DUMMIES	YES	YES	YES
PROVINCE DUMMIES	YES	YES	YES
Observed Prob.	0.387	0.075	0.221
Fitted Prob.	0.335	0.039	0.150
PSEUDO R^2	0.257	0.212	0.252
# OF OBS	633	1,765	1,644

Note: Standard errors in parentheses. The table entries correspond to probability derivatives. For each dummy variable covariate, the table shows the change in the probability of being trained due to switching the covariate value from 0 to 1. The derivatives and the Fitted Probabilities are calculated for the base person described at the bottom of Table 4.

*, + mean effect is significantly different from zero at the 5% and 10% significance level, respectively.

Table 12: **Probit Results for Whether Employer Paid for Training, Females**

Variable	Programme Training	Course Training	General Training
UNION	-0.008 (0.050)	-0.015 (0.016)	-0.022 (0.030)
ELEMSHS	-0.223 (0.082)*	-0.010 (0.037)	-0.176 (0.074)*
SOMEPS	-0.136 (0.069)+	-0.068 (0.040)*	-0.164 (0.057)*
PSGRAD	-0.013 (0.065)	-0.049 (0.022)*	-0.102 (0.040)*
UNIV	-0.080 (0.069)	-0.054 (0.026)*	-0.104 (0.045)*
AG1719	-0.232 (0.083)*	-0.062 (0.087)	-0.337 (0.093)*
AG2024	-0.036 (0.056)	-0.003 (0.028)	-0.093 (0.042)*
AG3544	0.076 (0.054)	-0.005 (0.016)	0.044 (0.029)
AG4554	-0.065 (0.063)	-0.031 (0.020)	0.002 (0.038)
AG5564	0.093 (0.176)	-0.014 (0.033)	0.127 (0.054)*
MANGR	0.045 (0.048)	0.036 (0.012)*	0.097 (0.025)*
PUBLIC	0.030 (0.063)	-0.061 (0.021)*	-0.055 (0.037)
FLT20	-0.012 (0.057)	-0.069 (0.029)*	-0.051 (0.037)
F2099	-0.048 (0.057)	-0.002 (0.019)	-0.011 (0.034)
F100199	-0.018 (0.083)	0.010 (0.022)	-0.061 (0.052)
F200499	0.069 (0.075)	0.032 (0.016)*	0.086 (0.038)*
TENURE/10	0.579 (0.110)*	0.233 (0.034)*	0.661 (0.067)*
TENSQ/100	-0.202 (0.064)*	-0.091 (0.017)*	-0.233 (0.035)*
INDUSTRY DUMMIES	YES	YES	YES
PROVINCE DUMMIES	YES	YES	YES
Observed Prob.	0.37	0.88	0.66
Fitted Prob.	0.33	0.92	0.70
PSEUDO R^2	0.185	0.192	0.218
# OF OBS	760	2,002	1,965

Note: Standard errors in parentheses. The table entries correspond to probability derivatives. For each dummy variable covariate, the table shows the change in the probability of being trained due to switching the covariate value from 0 to 1. The derivatives and the Fitted Probabilities are calculated for the base person described at the bottom of Table 4.

*, + mean effect is significantly different from zero at the 5% and 10% significance level, respectively.

Table 13: **Probit Results for Whether Worker Alone Paid for Training, Females**

Variable	Programme Training	Course Training	General Training
UNION	-0.071 (0.055)	0.027 (0.014)*	-0.003 (0.027)
ELEMSHS	-0.025 (0.126)	-0.010 (0.024)	0.095 (0.068)
SOMEPS	0.288 (0.066)*	0.037 (0.031)	0.233 (0.058)*
PSGRAD	0.152 (0.070)*	0.033 (0.018)+	0.149 (0.037)*
UNIV	0.267 (0.070)*	0.034 (0.021)+	0.175 (0.045)*
AG1719	0.175 (0.103)	0.026 (0.059)	0.228 (0.086)*
AG2024	0.054 (0.058)	0.006 (0.023)	0.138 (0.040)*
AG3544	-0.096 (0.056)+	-0.009 (0.012)	-0.063 (0.025)*
AG4554	0.052 (0.073)	-0.016 (0.013)	-0.046 (0.032)
AG5564	-0.079 (0.169)	0.001 (0.023)	-0.091 (0.047)+
MANGR	-0.045 (0.051)	-0.025 (0.010)*	-0.081 (0.022)*
PUBLIC	-0.021 (0.068)	0.008 (0.014)	0.031 (0.034)
FLT20	0.055 (0.059)	0.035 (0.022)+	0.033 (0.033)
F2099	0.133 (0.058)*	-0.002 (0.015)	0.026 (0.031)
F100199	0.091 (0.087)	-0.010 (0.017)	0.062 (0.048)
F200499	-0.003 (0.078)	-0.014 (0.014)	-0.050 (0.034)
TENURE/10	-0.379 (0.125)*	-0.111 (0.027)*	-0.418 (0.060)*
TENSQ/100	0.130 (0.071)+	0.046 (0.013)*	0.148 (0.031)*
INDUSTRY DUMMIES	YES	YES	YES
PROVINCE DUMMIES	YES	YES	YES
Observed Prob.	0.549	0.081	0.279
Fitted Prob.	0.548	0.050	0.232
PSEUDO R^2	0.175	0.156	0.181
# OF OBS	760	2,002	1,965

Note: Standard errors in parentheses. The table entries correspond to probability derivatives. For each dummy variable covariate, the table shows the change in the probability of being trained due to switching the covariate value from 0 to 1. The derivatives and the Fitted Probabilities are calculated for the base person described at the bottom of Table 4.

*, + mean effect is significantly different from zero at the 5% and 10% significance level, respectively.

7. Trends in Union Effects: 1993 to 1997

Up to now, we have only been focusing on the analysis of the impact of unions on training at one point in time using the 1997 AETS. In Table 14, we reproduce some of the basic tabulations of Table 1 for 1997 and compare those to the same measures from the 1993 AETS. We just focus on the breakdown between programme and course training to simplify the exposition. Two main pattern of results emerge from this comparison. First, the overall incidence of training has declined by 1-2 percentage points between 1993 and 1997. A close examination of the table also indicates that the overall decline is mostly due to the decline in course training. By contrast, the incidence of programme training is very stable over time. The second key pattern is that differences in training between union and non-union workers are very stable over time. For all workers pooled together, union workers are 4 percentage points more likely to train both in 1993 and 1997. In both years, these aggregate figures mask the fact that union males are 1 percentage point less likely to train than non-union males, while union females are 8-9 percentage points more likely to train than non-union females.

Table 14 **Trends in Training Rates, 1993 and 1997**

Outcome	All Non-union	All Union	Males Non-union	Males Union	Females Non-union	Females Union
1993						
All Training	0.30	0.34	0.30	0.31	0.29	0.38
Program Training	0.099	0.078	0.098	0.067	0.100	0.091
Course Training	0.22	0.28	0.22	0.26	0.21	0.31
1997						
All Training	0.28	0.32	0.28	0.29	0.28	0.36
Program Training	0.097	0.076	0.097	0.066	0.098	0.089
Course Training	0.20	0.26	0.20	0.23	0.20	0.30

The union impacts in 1993 and 1997 remain very similar after we control for the set of covariates used in the previous tables. Table 15 shows the estimated probability derivatives based on a probit model for men and women in 1993 and 1997. The 1997 results are the same as in the corresponding models of Tables 4-5 (men) and 7-8 (women) except for the fact that we do not use the variable for managerial responsibilities in the models of Table 15 since this variable is not available in 1993. Generally speaking, the results are remarkably similar across gender and year. The estimated union impact is negative for all of the four groups (two genders and two years). Furthermore, the negative impact of unions on course training is systematically larger (in absolute value) than the impact on programme training. In fact, the estimated effects are remarkably similar among the four groups except for the fact that union effects are slightly larger (in absolute value) for men in 1993 that for the other groups. We conclude from this comparison that union impacts on training are very stable over time and that the results presented in the previous section can be generalized to the earlier part of the 1990s.[10]

Table 15: **Probit Estimates of the Effect of Unions on Training, 1993 and 1997**

	All Training	Programme Training	Course Training
Men, 1993	-0.078 (0.011)*	-0.016 (0.005)*	-0.064 (0.010)*
Men, 1997	-0.043 (0.012)*	-0.002 (0.006)	-0.044 (0.011)*
Women, 1993	-0.042 (0.012)*	-0.004 (0.006)	-0.044 (0.011)*
Women, 1997	-0.043 (0.013)*	-0.005 (0.007)	-0.035 (0.011)*

Note: Standard errors in parentheses. The table entries correspond to probability derivatives. For each dummy variable covariate, the table shows the change in the probability of being trained due to switching the covariate value from 0 to 1. Other regressors included in these models are the same as in Tables 5 and 8 except for the variable MANGR which is not included as it was not available in the 1993 AETS.

* mean effect is significantly different from zero at the 5% significance level.

[10] We reran all the models presented in Section 5 and 6 for 1993 and generally found very similar results. Basic tabulations from the 1991 AETS also suggest similar raw union training effects. Given this, we only report few summary results in Tables 14 and 15 to avoid reporting an excessive number of tables.

8. Selection

A key concern in any study of union impacts is the issue of selectivity. Workers and jobs are not randomly assigned to union status. Unions find some workplaces easier to organize and individuals may differ in their willingness to apply for union jobs. In terms of training, if more stable jobs are easier to unionize (because the workers are around long enough to get them to vote) then we might believe that unions have effects on training through promoting job stability when really they just organize jobs that are already stable (with the training side effects that go along with that). To get at true union effects we would like to run experiments of various types. One possible experiment is one in which workers are randomly assigned to union status. We could then observe average training outcomes for union and non-union workers and would be able to assign any observed differences to causal union impacts. This is the type of thought experiment that underlies standard sample selection techniques such as the Heckman two stage estimation technique. The difficulty with this approach is that the answer may not be very policy relevant: workers are not actually randomly assigned to union status. If we are considering policies that induce a few extra workers to join or leave unions then we would like to know the effect of unions on training for these marginal workers. This is the kind of thought experiment behind careful use of instruments, such as in Local Average Treatment Effect Estimators. In both approaches, results depend crucially on selection of an exclusion restriction: a variable or set of variables that are assumed to affect the unionisation outcome but not to have a direct impact on training outcomes. A good instrument of this type is hard to find in general. We have been so far unsuccessful in uncovering a convincing instrument for unionisation in the AETS. At first pass, therefore, we have not tried to address this problem directly. Our belief is that a simple regression style estimator is preferable to an instrumental approach where the instrument is unconvincing. In the latter case, it can be quite difficult to derive meaningful interpretations of the results.

In the longer run, our intention is to address the selection problem making use of time variation in the unionisation rate. The unionisation rate among young people in Canada has declined considerably over the last 20 years (Beaudry, Green and Townsend(2001)). This should mean that we will observe lower unionisation rates among young people in the 1997 AETS compared to the 1991-93 AETS. If unions only have selection style effects then the shift in workers out of the union section over the 1990s should

have no impact on training outcomes. On the other hand, to the extent that unions have causal impacts, one should see movements in training outcomes that are line with theoretical predictions of union impacts on training. Of course, whether we can use this strategy depends crucially on whether there is really a large enough decline in unionisation in these years to yield potentially observable effects. Unfortunately, preliminary explorations indicate that changes in unionisation between 1991-93 and 1997 are not quite large enough to be used as a good instrumentation strategy. Hopefully, the next AETS planned for 2003 will provide a long enough window to get enough variation for this approach to work.

9. Conclusions

In this paper, we have implemented an empirical investigation of the impact of unionisation on training in Canada using the AETS. Simple tabulations indicate that unions have positive though small direct impacts on overall training levels. However, these overall effects hide larger differences for specific sub-groups and for different types of human capital investment. In particular, there are substantial differences between males and females. Basic tabulations also indicate some substantial differences in sources of funding for training between the union and non-union sectors.

Our main results stem from exercises in which we control for the effects of other covariates to get a cleaner picture of union impacts. Once one controls for other covariates, our results paint relatively similar pictures for men and women. If anything, these effects are typically small and negative, in the range from -4 percentage points to zero. By contrast, when we do not control for other covariates, union effects range from 10 percentage points (course training for women) to -3 percentage points (programme training for men). So it appears that most of the difference in the raw union effect across subgroups can actually be accounted for by differences between union and non-union workers in other characteristics. Unionisation does, to some extent, generate greater employer involvement in payment for both general and firm specific human capital for men, though these effects are typically not significant. For men, then, unionisation shifts who pays for the training more than the level of training. This fits with models in which union pay structures lead to unionized firms taking a greater role in funding general human capital investment but do not necessarily change the amount of investment. To explain the small declines in general human capital investment for men, the distinction between alternative human capital (useful only outside the firm) and general human capital (useful both inside and outside the current firm) proposed by Kuhn and Sweetman. With that distinction, more stable union work arrangements could lead workers to under-invest in alternative human capital (since they don't expect to have to work outside the current firm in the future). At the same time, firms play an expanded role because narrow wage differences between skill groups in the union sector provide firms with an incentive to invest in general human capital. The pattern of tenure effects is also consistent with this view.

For women, the results indicate effects of unionisation on general and firm specific human capital investment similar to those for men. But in terms of payments, unionisation has, if anything, a negative

impact on the proportion of spells in which firms help in the funding. It does not have any substantial effects on the proportion of general human capital training invested in by workers alone. As in the case of men, the most robust finding is that employer involvement in funding training increases with tenure while the opposite is true for worker involvement. It is worth noting, in closing, that we find weak direct union effects, controlling for firm size and tenure. However, to the extent that unions promote greater job stability (i.e., high tenure), they will have a positive indirect effect on getting firms involved in training according to our results.

Appendix

Variable Definitions

Variable	Definition
TRAIN	= 1 for individuals with either programme or course based training that is related to current or future employment
PROGRAMME TRAINING	= 1 for individuals with programme based training that is related to current or future employment (first definition of general training)
COURSE TRAINING	= 1 for individuals with course based training that is related to current or future employment (first definition of firm specific training)
GENERAL TRAINING	= 1 for individuals with course based training that is not provided directly by the employer or programme based training
FIRM SPEC. TRAINING	= 1 for individuals with course based training that is provided directly by the employer
UNION	= 1 for individuals who are members of a union and/or are covered by a collective agreement on their main job in 1997
ELEMHS	= 1 for individuals whose highest education is elementary or some (but not completed) high school
HSGRAD	= 1 for individuals whose highest education is high school graduation (based category in estimation)
SOMEPS	= 1 for individuals whose highest education is some (but not completed) post-secondary
PSGRAD	= 1 for individuals whose highest education is a certificate or diploma from a post-secondary institution other than a university
UNIV	= 1 for individuals whose highest education is a certificate, diploma or degree from a university (includes BA, MA, PhD, etc.)
AG1719	= 1 for individuals aged 17 to 19
AG2024	= 1 for individuals aged 20 to 24
AG2534	= 1 for individuals aged 25 to 34 (base category)
AG3544	= 1 for individuals aged 35 to 44
AG4554	= 1 for individuals aged 45 to 54
AG5564	= 1 for individuals aged 55 to 64
MANGR	= 1 for individuals with some managerial or supervisory responsibility
PUBLIC	= 1 for individuals whose main job in 1997 was in the public sector

AGR	= 1 for individuals whose main job was in agriculture
PRIM	= 1 for individuals whose main job was in other primary industries
NONDUR	= 1 for individuals whose main job was in the nondurable manufacturing industry
CONSTR	= 1 for individuals whose main job was in the construction industry
TRANS	= 1 for individuals whose main job was in the transportation and communication industries
SALES	= 1 for individuals whose main job was in the retail and wholesale trade industries
BUSSERV	= 1 for individuals whose main job was in the business services industry
PSERV	= 1 for individuals whose main job was in the personal services industry
PADMIN	= 1 for individuals whose main job was in the public administration industry
FLT20	= 1 for individuals working for firms employing fewer than 20 employees
F2099	= 1 for individuals working for firms employing 20 to 99 employees
F100199	= 1 for individuals working for firms employing 100 to 199 employees
F200499	= 1 for individuals working for firms employing 200 to 499 employees
FGT500	= 1 for individuals working for firms employing 500 or more employees
TENURE	= years of job tenure
TENSQ	= years if job tenure squared

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